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WATER SUPPLY OUTLOOK FOR MONTANA

and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

UNITED STATES DEPARTMENT of AGRICULTURE - SOIL CONSERVATION SERVICE,
and
MONTANA AGRICULTURAL EXPERIMENT STATION

Data included in this report were obtained by the
agencies named above in cooperation with Federal,
State, and private organizations listed on the
inside back cover of this report.

**SNOW PILLOW RECORDS
1969 WATER YEAR**

TO RECIPIENTS OF WATER SUPPLY OUTLOOK REPORTS:

Most of the usable water in western states originates as mountain snowfall. This snowfall accumulates during the winter and spring, several months before the snow melts and appears as streamflow. Since the runoff from precipitation as snow is delayed, estimates of snowmelt runoff can be made well in advance of its occurrence. Streamflow forecasts published in this report are based principally on measurement of the water equivalent of the mountain snowpack.

Forecasts become more accurate as more of the data affecting runoff are measured. All forecasts assume that climatic factors during the remainder of the snow accumulation and melt season will interact with a resultant average effect on runoff. Early season forecasts are therefore subject to a greater change than those made on later dates.

The snow course measurement is obtained by sampling snow depth and water equivalent at surveyed and marked locations in mountain areas. A total of about ten samples are taken at each location. The average of these are reported as snow depth and water equivalent. These measurements are repeated in the same location near the same dates each year.

Snow surveys are made monthly or semi-monthly from January 1 through June 1 in most states. There are about 1400 snow courses in Western United States and in the Columbia Basin in British Columbia. In the near future, it is anticipated that automatic snow water equivalent sensing devices along with radio telemetry will provide a continuous record of snow water equivalent at key locations.

Detailed data on snow course and soil moisture measurements are presented in state and local reports. Other data on reservoir storage, summaries of precipitation, current streamflow, and soil moisture conditions at valley elevations are also included. The report for Western United States presents a broad picture of water supply outlook conditions, including selected streamflow forecasts, summary of snow accumulation to date, and storage in larger reservoirs.

Snow survey and soil moisture data for the period of record are published by the Soil Conservation Service by states about every five years. Data for the current year is summarized in a West-wide basic data summary and published about October 1 of each year.

PUBLISHED BY SOIL CONSERVATION SERVICE

The Soil Conservation Service publishes reports following the principal snow survey dates from January 1 through June 1 in cooperation with state water administrators, agricultural experiment stations and others. Copies of the reports for Western United States and all state reports may be obtained from Soil Conservation Service, Western Regional Technical Service Center, Room 209, 701 N. W. Glisan, Portland, Oregon 97209.

Copies of state and local reports may also be obtained from state offices of the Soil Conservation Service in the following states:

STATE	ADDRESS
Alaska	P. O. Box "F", Palmer, Alaska 99645
Arizona	6029 Federal Building, Phoenix, Arizona 85205
Colorado (N. Mex.)	12417 Federal Building, Denver, Colorado 80521
Idaho	P. O. Box 38, Boise, Idaho 83707
Montana	P. O. Box 98, Bozeman, Montana 59715
Nevada	P. O. Box 4850, Reno Nevada 89505
Oregon	1218 S. W. Washington St., Portland, Oregon 97205
Utah	4012 Federal Building, Salt Lake City, Utah 84111
Washington	360 U.S. Court House, Spokane, Washington 99201
Wyoming	P. O. Box 340, Casper, Wyoming 82602

PUBLISHED BY OTHER AGENCIES

Water Supply Outlook reports prepared by other agencies include a report for California by the Water Supply Forecast and Snow Surveys Unit, California Department of Water Resources, P. O. Box 388, Sacramento, California 95802 --- and for British Columbia by the Department of Lands, Forests and Water Resources, Water Resources Service, Parliament Building, Victoria, British Columbia



WATER SUPPLY OUTLOOK FOR MONTANA

and
FEDERAL - STATE - PRIVATE COOPERATIVE SNOW SURVEYS

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Report prepared by

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SOIL CONSERVATION SERVICE
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Bozeman, Montana 59715

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MONTANA WATER SUPPLY OUTLOOK
October 1, 1969

MISSOURI RIVER BASIN

The 1969 water year began with extremely heavy snowfall during the early winter months, with a gradual decrease percentagewise in snow accumulation through the remainder of the season. The spring and summer months were relatively dry, with the exception of some areas which received heavy precipitation during June.

The snowpack was below average in the Marias, Sun and Teton river drainages. The below average precipitation pattern continued during the spring and summer months. However, reservoir storage was generally adequate for maturing crops on irrigated lands.

Southwestern Montana had a heavy snowpack and received adequate precipitation during the spring and summer months. Some areas had an April-September runoff in excess of 200 percent of average.

Streamflow on the Yellowstone river drainage was near average with the exception of above average runoff in the main stream headwaters.

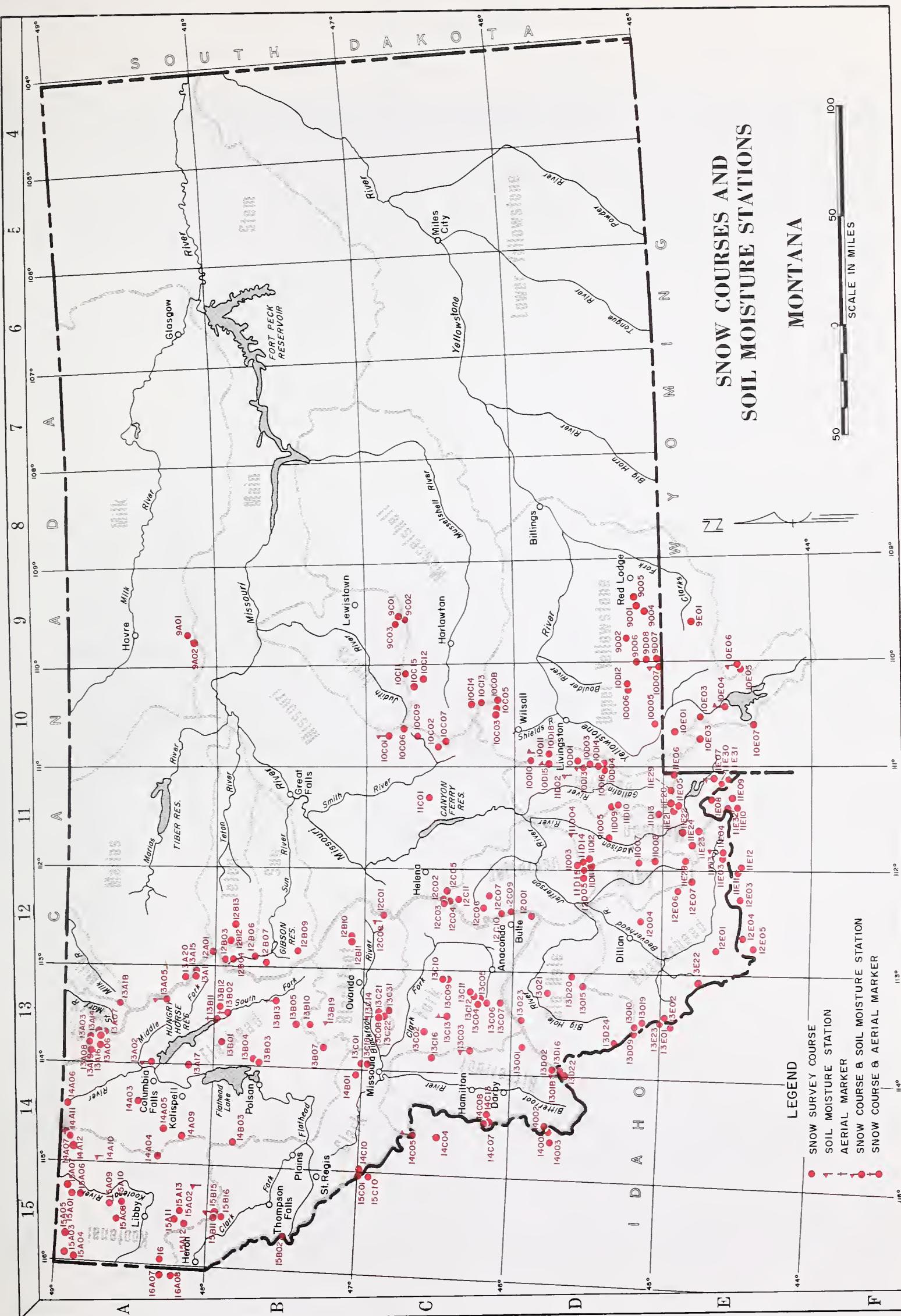
Most mountain soils are generally drier than normal and will need adequate fall rains or some of next year's snowmelt for repriming.

Irrigation reservoir storage is generally below average as a result of the drier summer months and heavy irrigation demands.

COLUMBIA RIVER BASIN

Well above average snowfall occurred in the early part of the 1969 water year. Snowfall accumulation decreased percentagewise after March. Precipitation was generally deficient over the basin during the spring and summer months; however, significant amounts were received in some areas during June. In general, the heavy runoff occurred earlier than normal.

Most mountain soils are drier than normal. Prospects for next year's water supply will depend largely on the snowpack accumulation during the coming winter months.



INDEX to MONTANA SNOW COURSES and SOIL MOISTURE STATIONS

NEW COURSES

SNOW PILLOW DATA
WATER YEAR 1969

BANFIELD MOUNTAIN

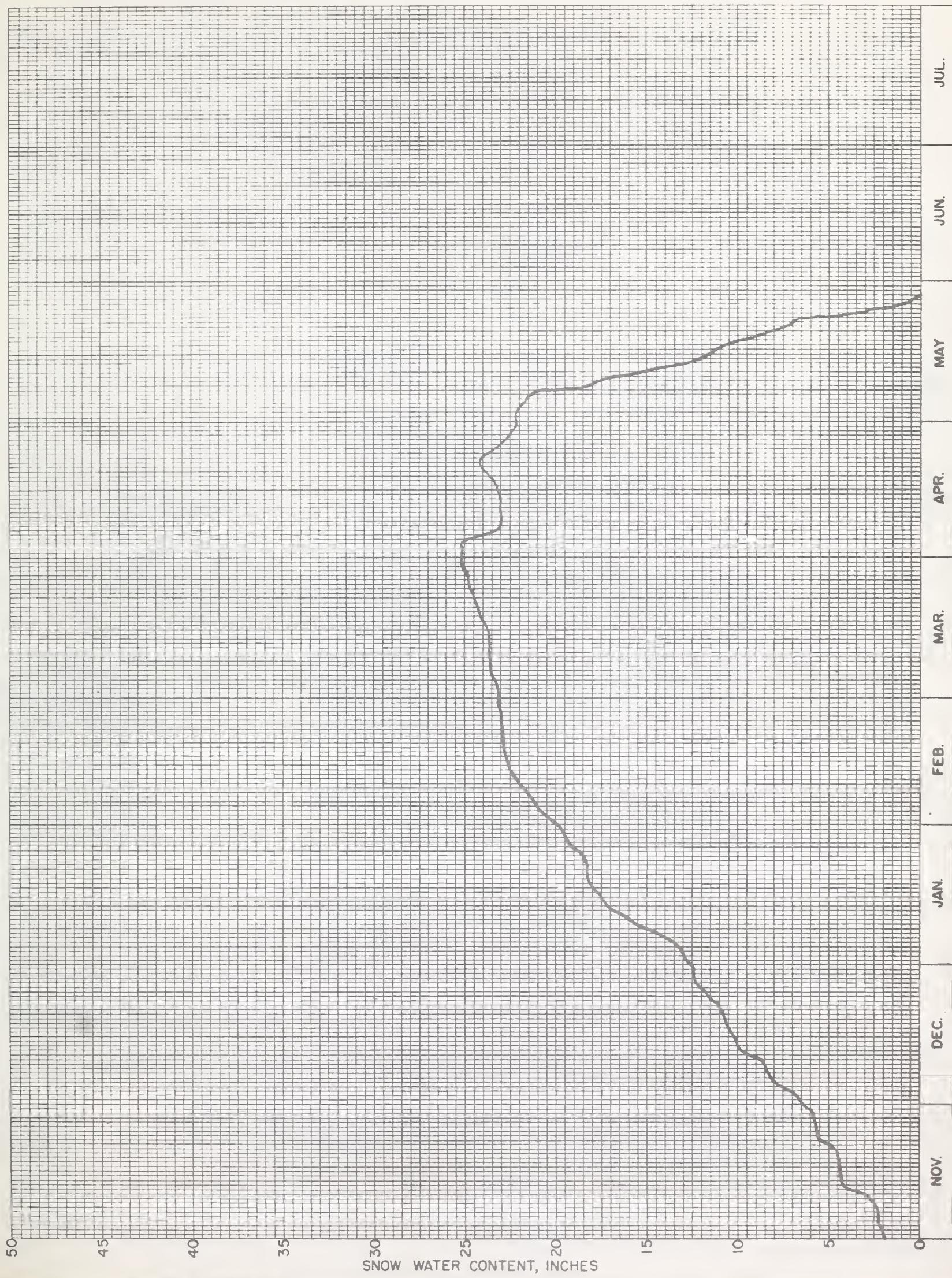
No. 15A08

Elev.

5600

Drainage:

Kootenai



SNOW PILLOW DATA
WATER YEAR 1969

GARVER CREEK

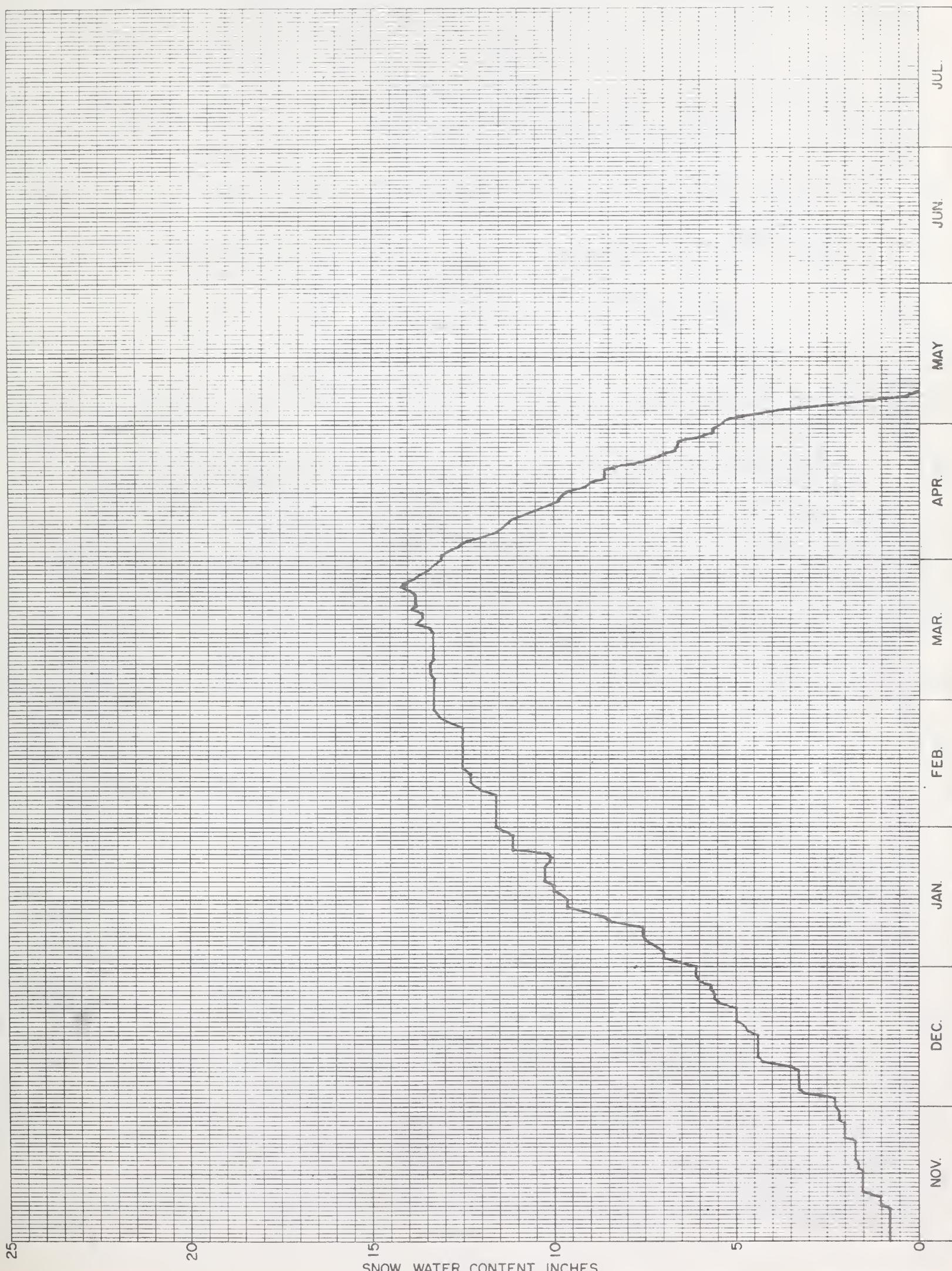
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Elev.

4250

Drainage:

Kootenai



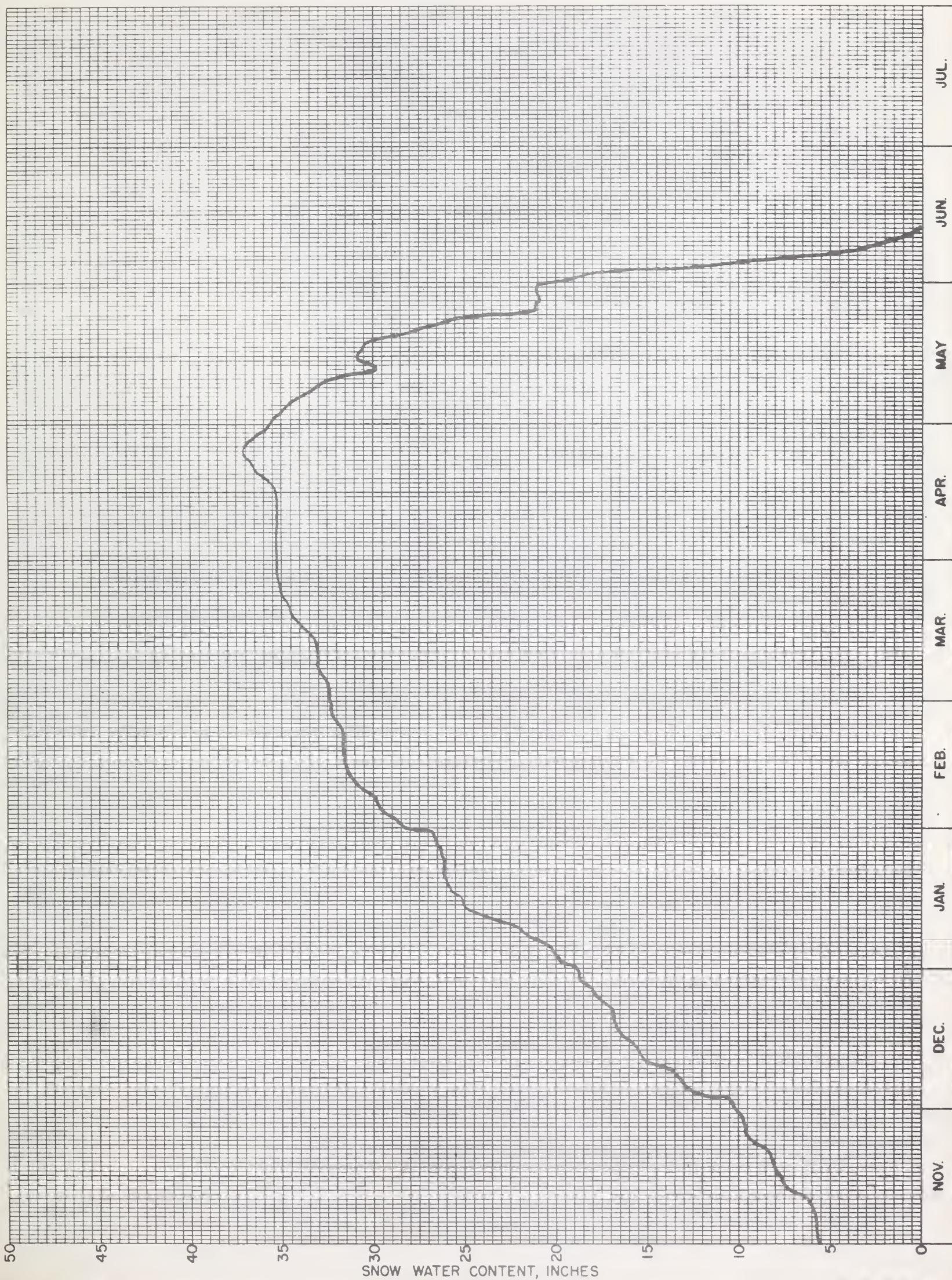
SNOW PILLOW DATA
WATER YEAR 1969

HAWKINS LAKE

No. 15A03

Elev. 6450

Drainage: Kootenai



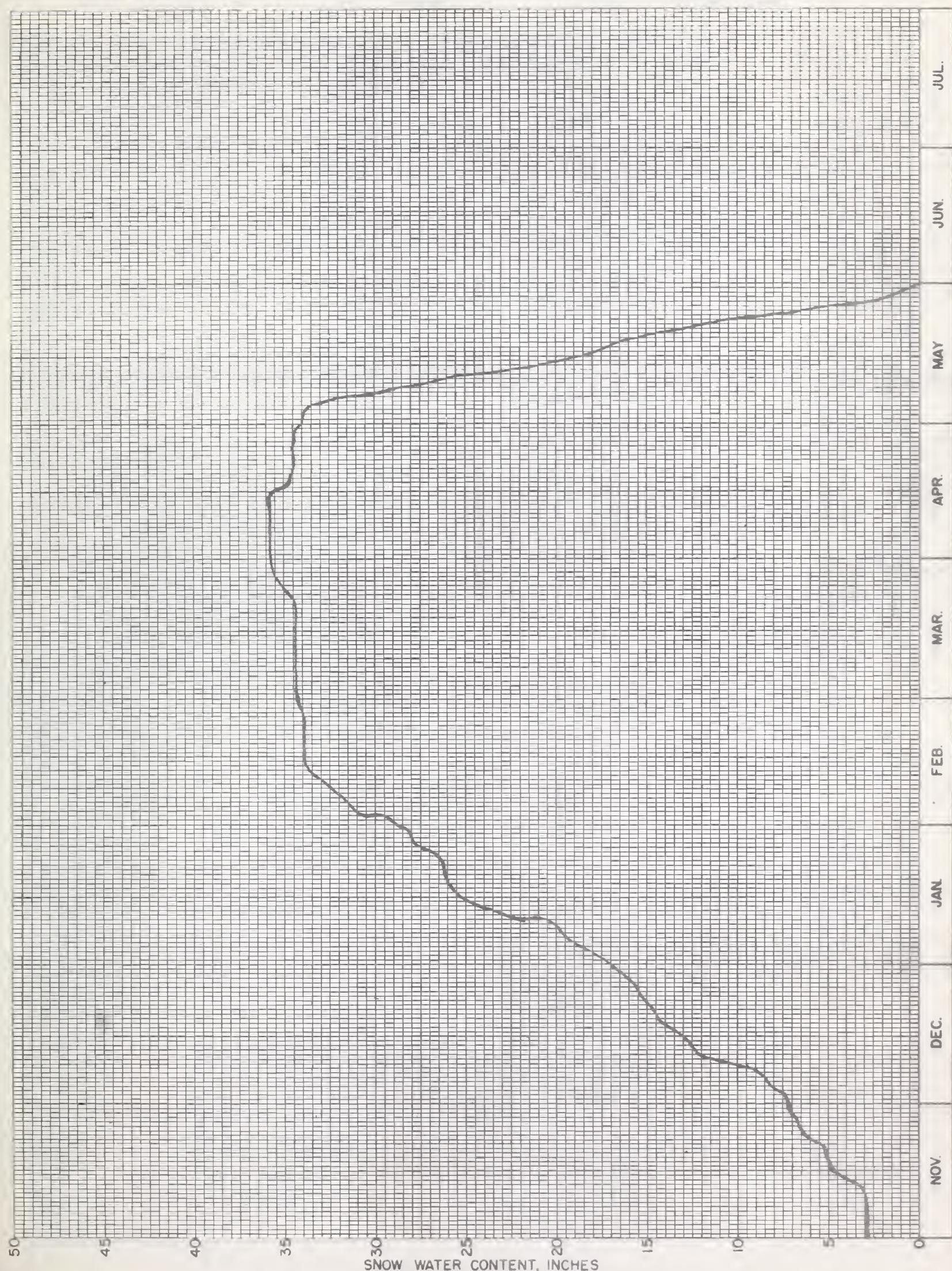
SNOW PILLOW DATA
WATER YEAR 1969

POORMAN CREEK

No. 15A12

Elev. 5100

Drainage: Kootenai



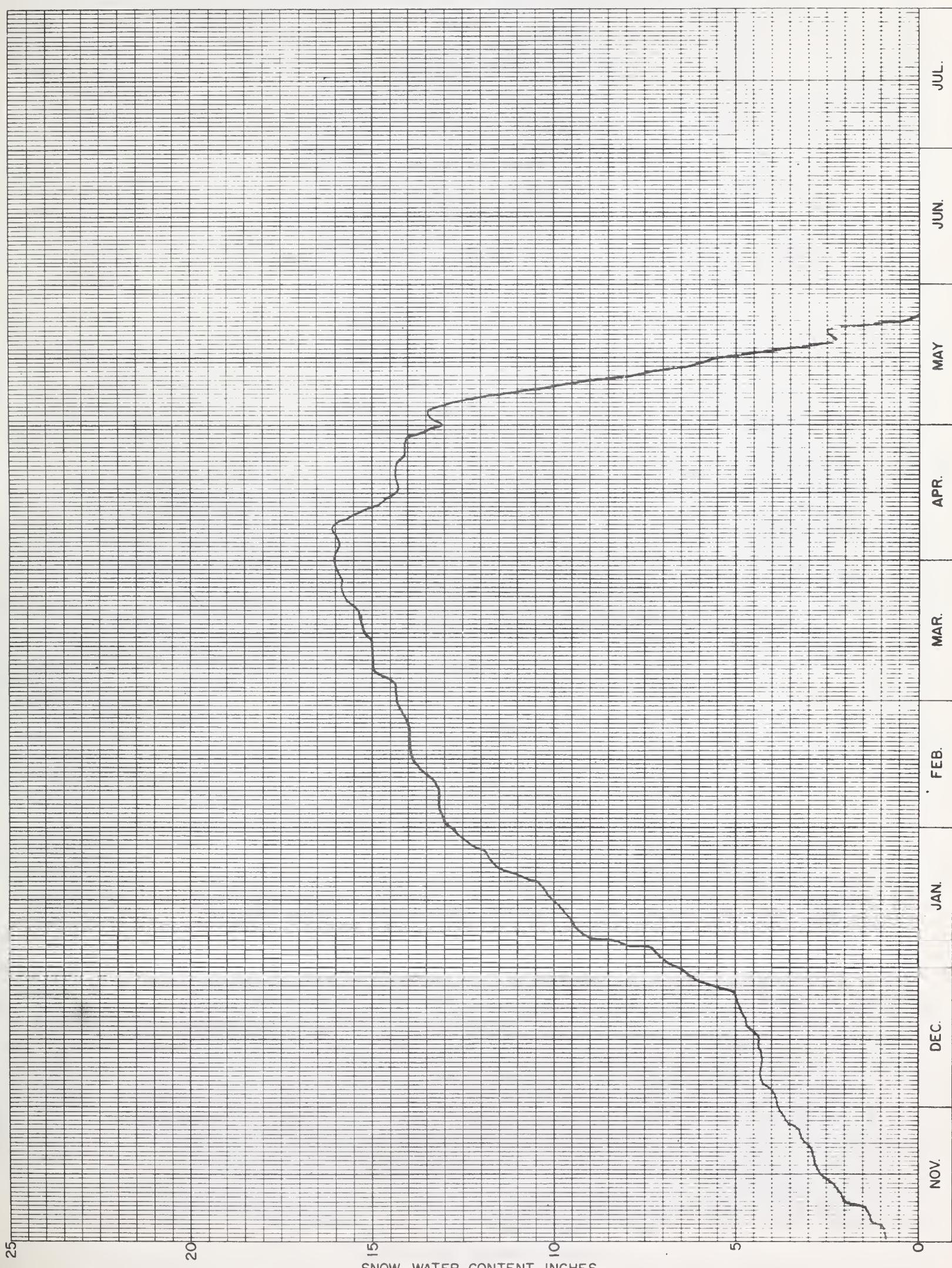
SNOW PILLOW DATA
WATER YEAR 1969

BLACK PINE

No. 13C13

Elev. 7100

Drainage: Clark Fork



SNOW PILLOW DATA
WATER YEAR 1969

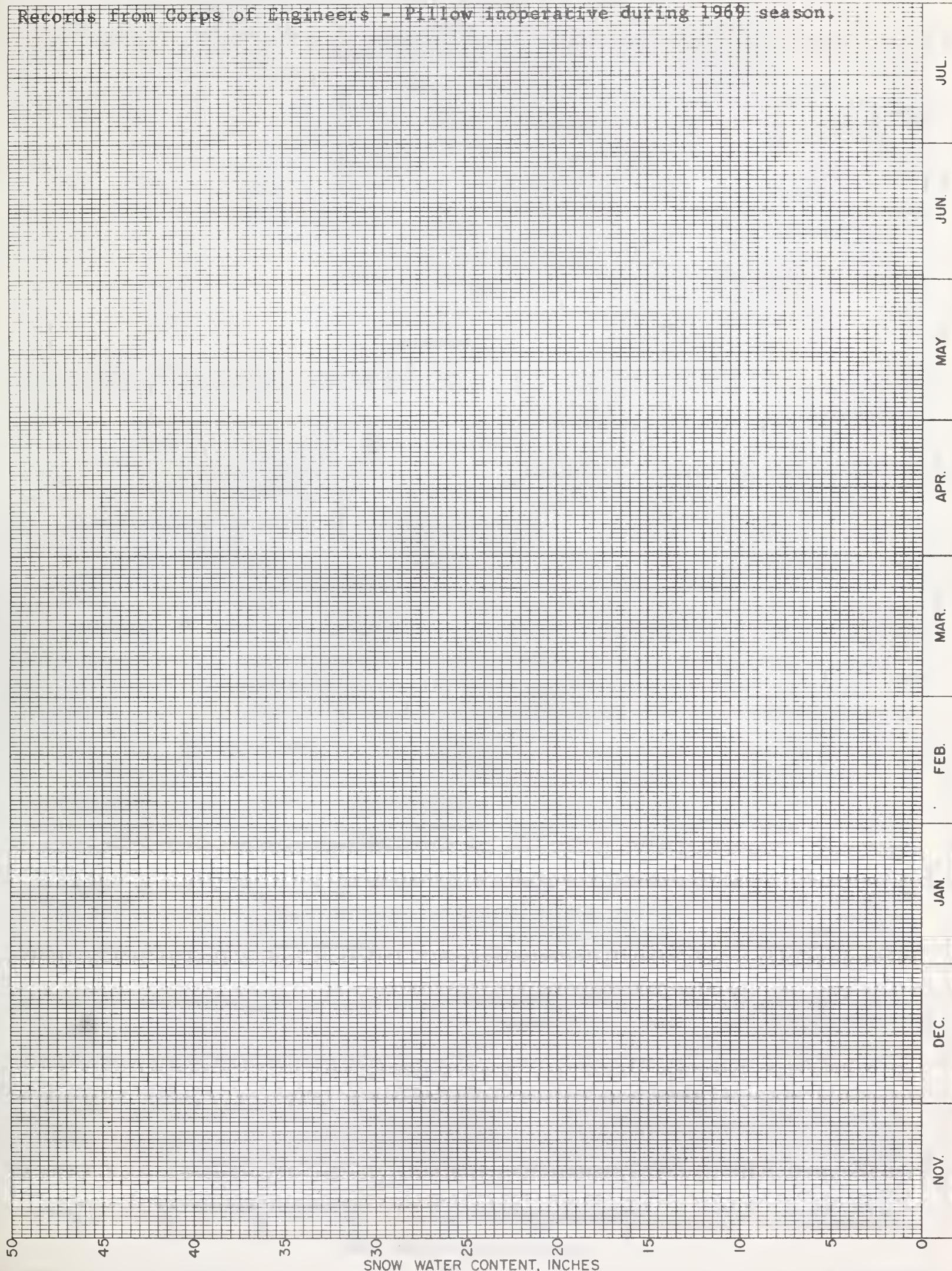
HOODOO BASIN

No. 15C10

Elev. 6000

Drainage: Clark Fork

Records from Corps of Engineers - Pillow inoperative during 1969 season.



WATER YEAR 1969

SADDLE MOUNTAIN

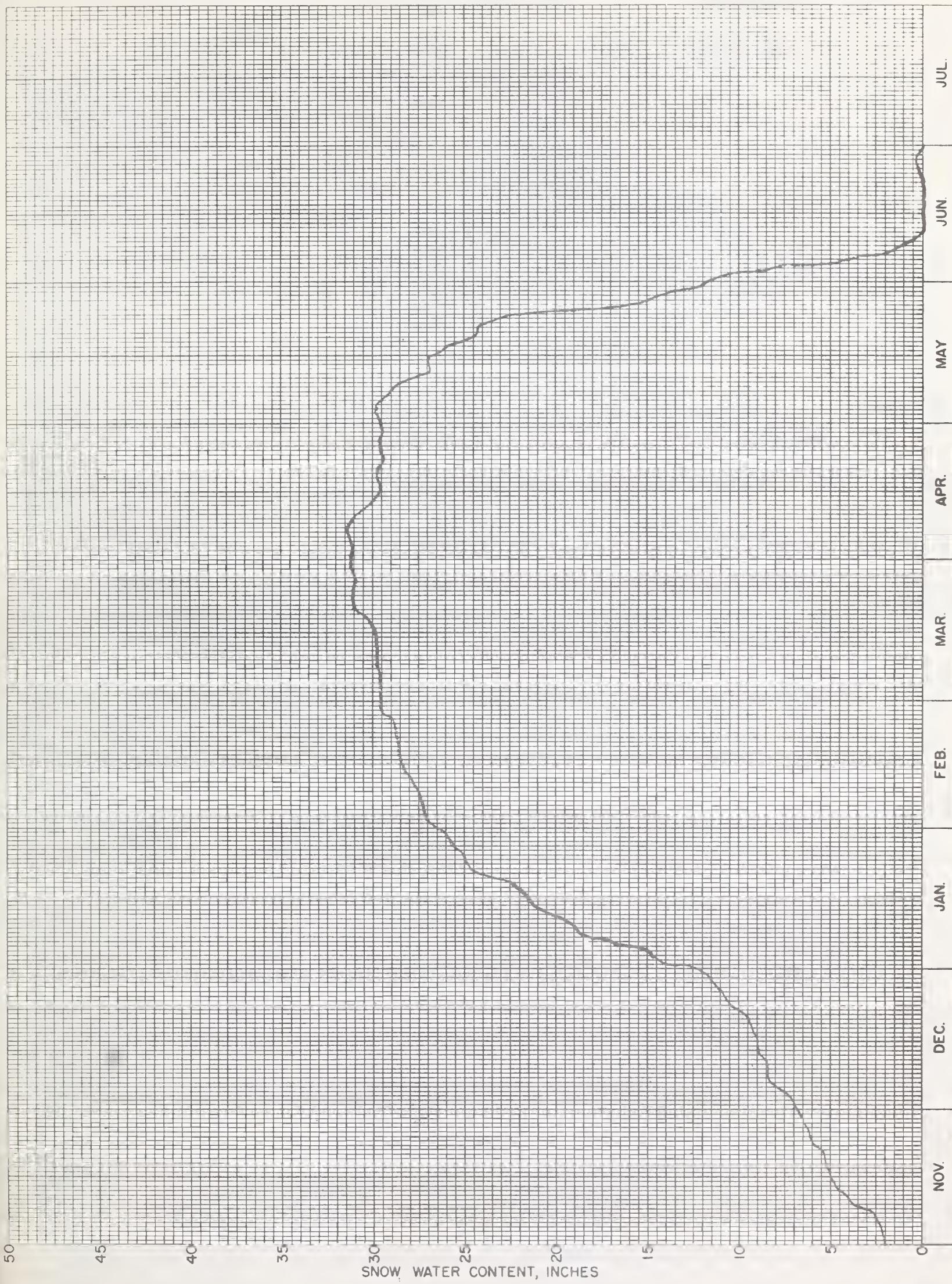
No. 13D22

Elev.

7900

Drainage:

Bitterroot





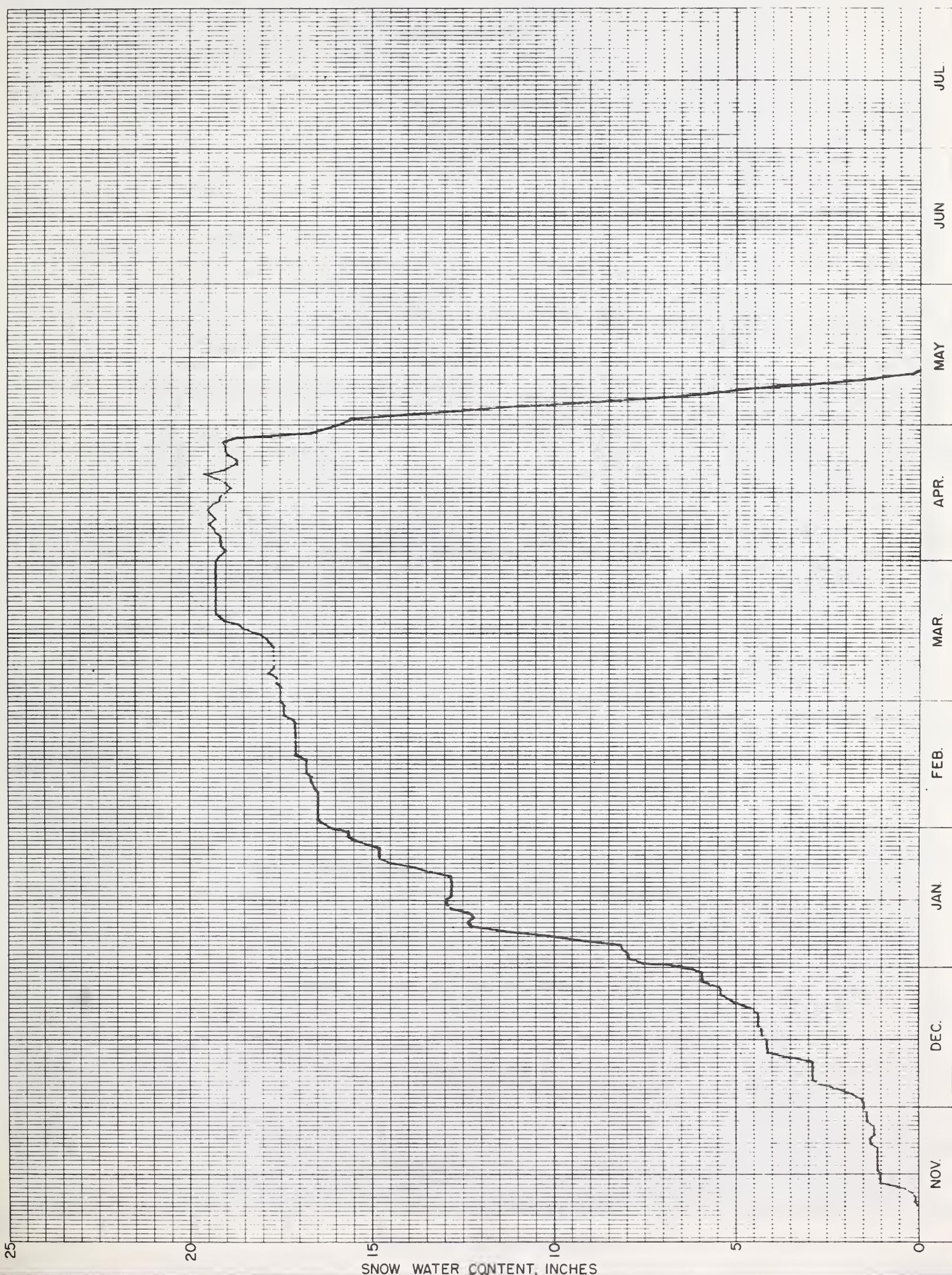
SNOW PILLOW DATA
WATER YEAR 1969

TWELVEMILE CREEK

No. 14C13

Elev. 5600

Drainage: Bitterroot





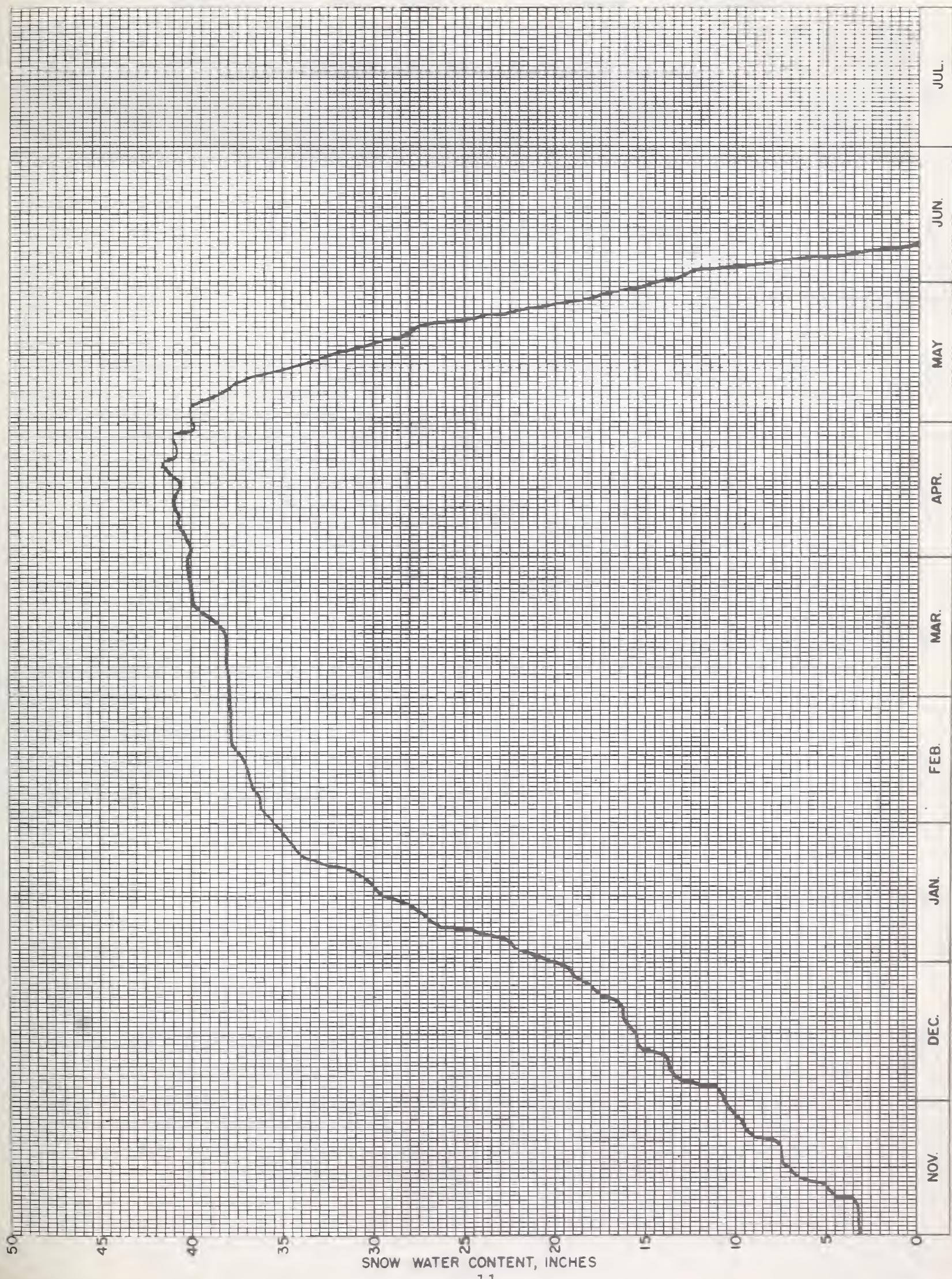
SNOW PILLOW DATA
WATER YEAR 1969

TWIN LAKES

No. 14C12

Elev. 6400

Drainage: Bitterroot



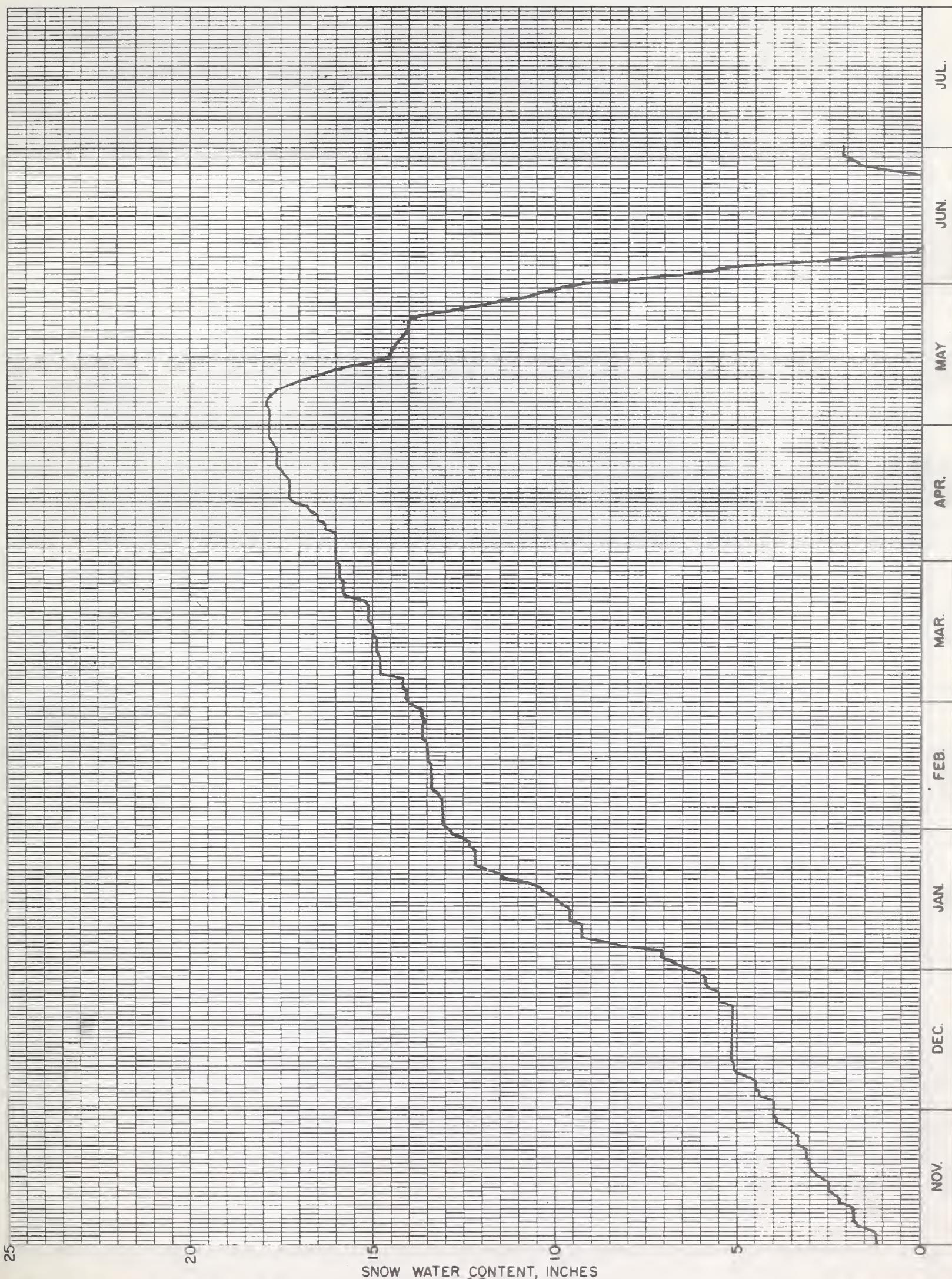
SNOW PILLOW DATA
WATER YEAR 1969

ROCKER PEAK

No. 12C11

Elev. 8000

Drainage: Jefferson



SNOW PILLOW DATA
WATER YEAR 1969

LION MOUNTAIN

No. 11E28

Elev. 8760

Drainage: Madison

Records from Forest Service - Pillow inoperative during 1969 season.

25

20

15

10

5

0

SNOW WATER CONTENT, INCHES



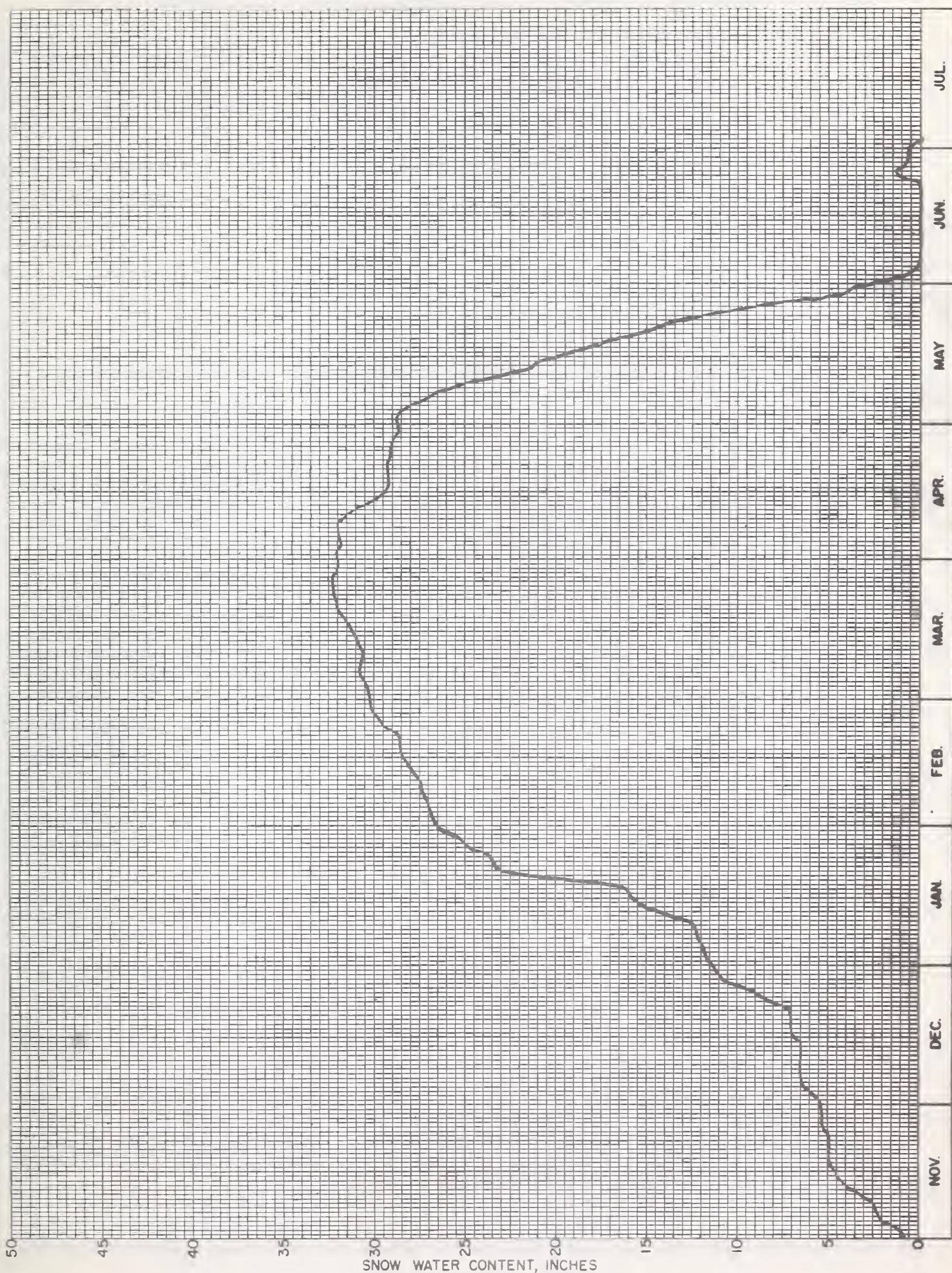
SNOW PILLOW DATA
WATER YEAR 1969

MADISON PLATEAU

No. 11E31

Elev. 7750

Drainage: Madison



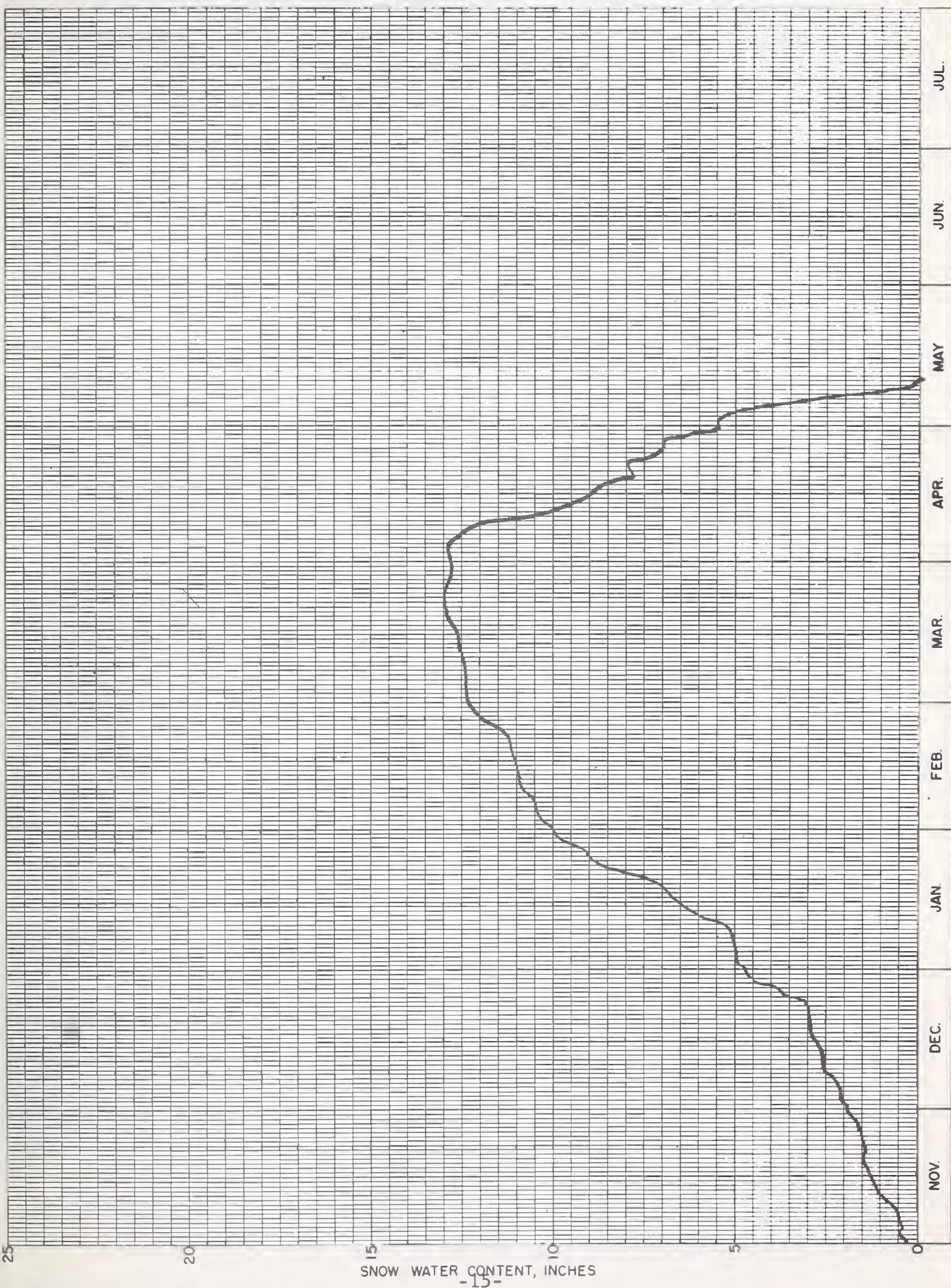
SNOW PILLOW DATA
WATER YEAR 1969

WEST YELLOWSTONE

No. 11E07

Elev. 6700

Drainage: Madison





SNOW PILLOW DATA
WATER YEAR 1969

BANGTAIL

No. 10D20

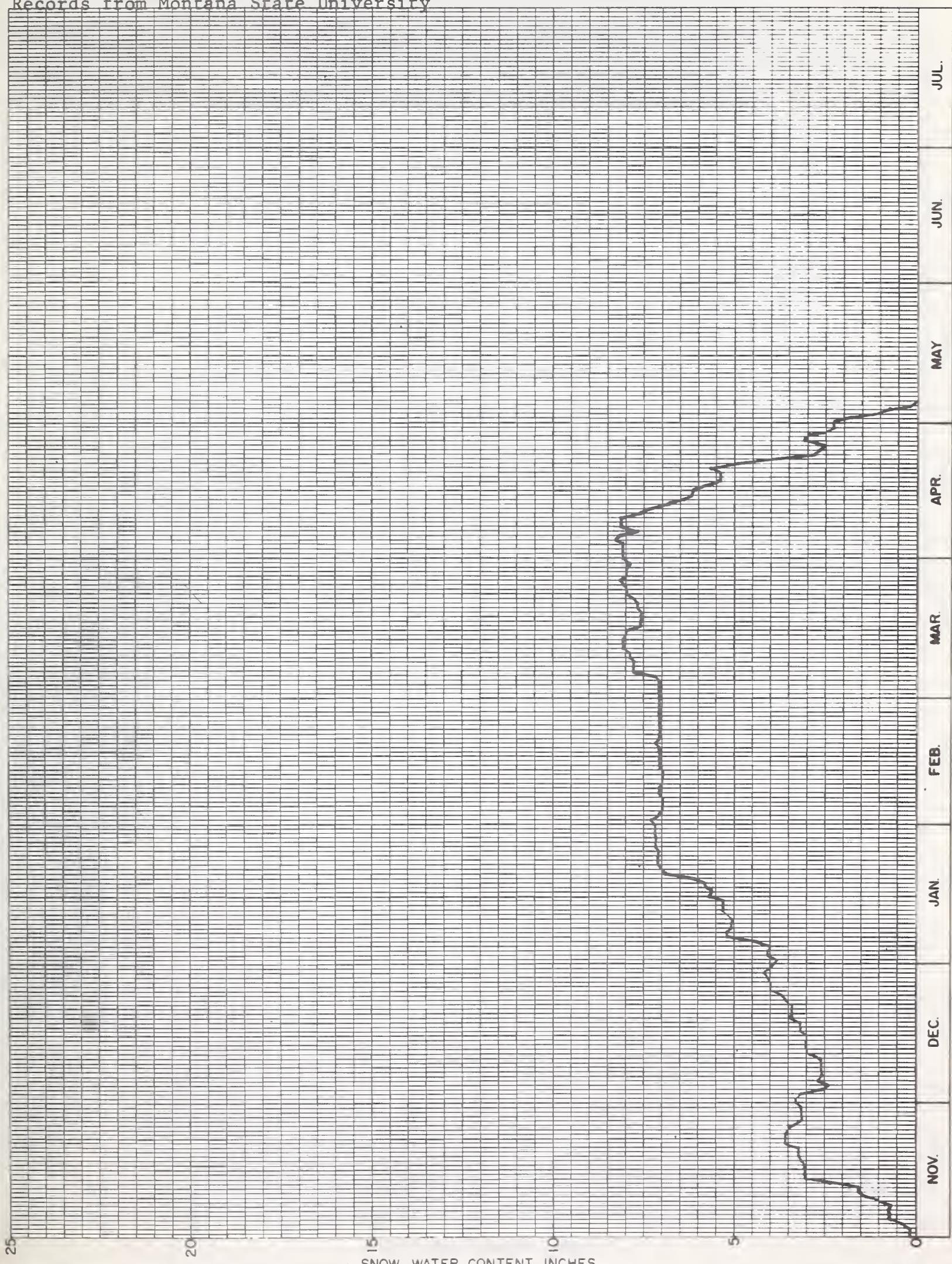
Elev.

7900

Drainage:

Gallatin

Records from Montana State University



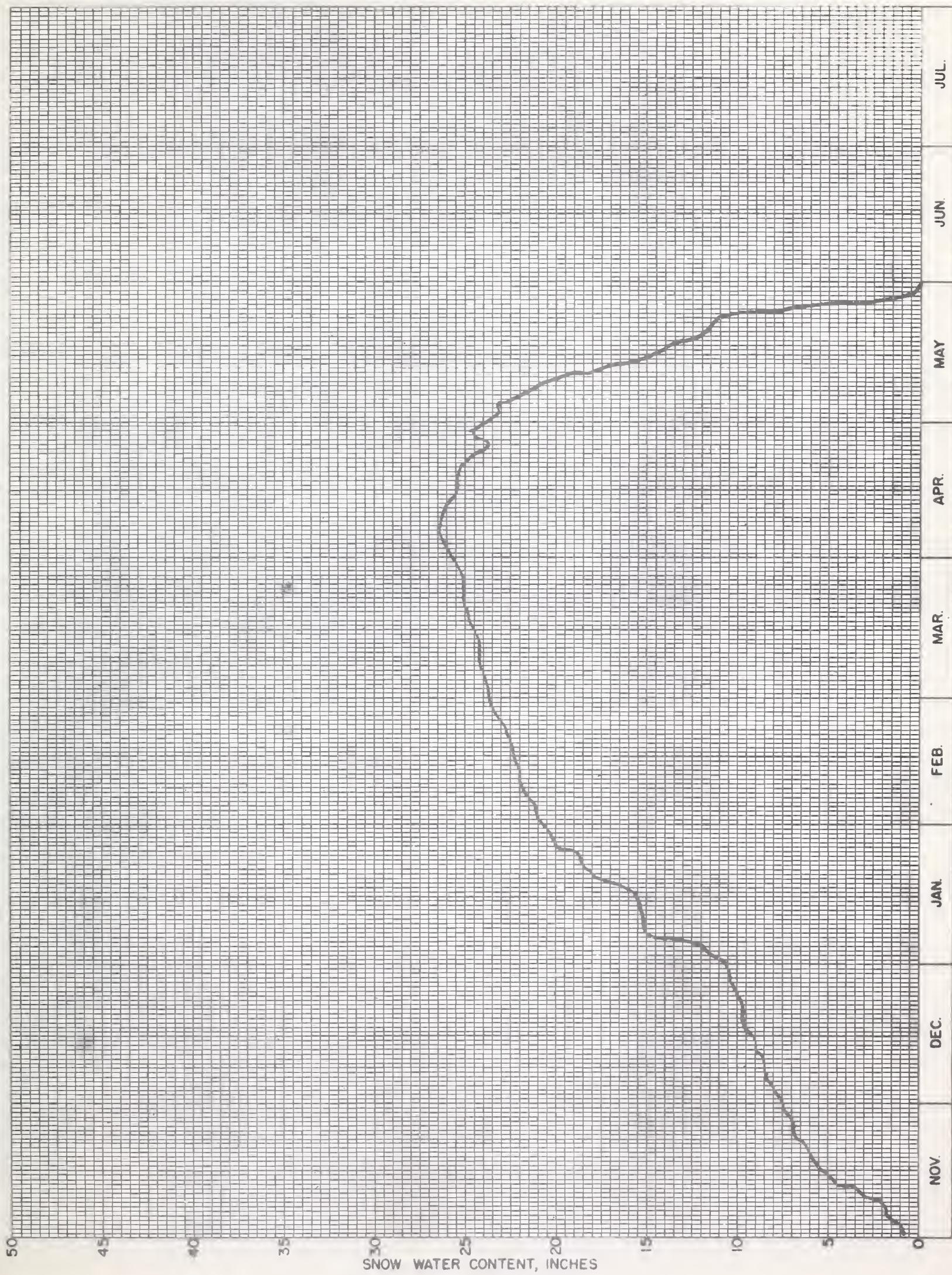
SNOW PILLOW DATA
WATER YEAR 1969

BRIDGER BOWL

No. 10D15

Elev. 7250

Drainage: Gallatin



4
M

SNOW PILLOW DATA
WATER YEAR 1969

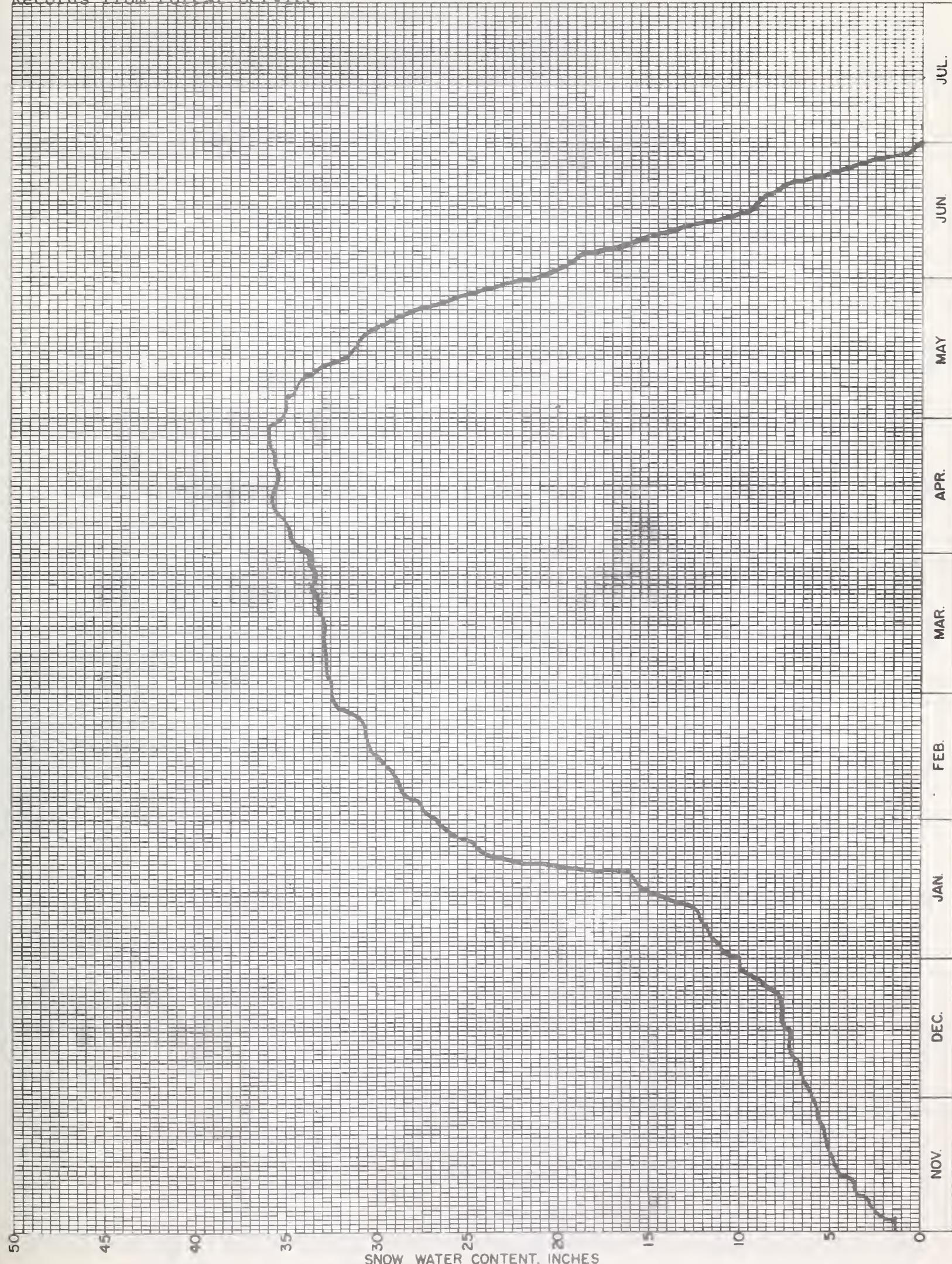
CARROT BASIN

No. 11E29

Elev. 9000

Drainage: Gallatin

Records from Forest Service



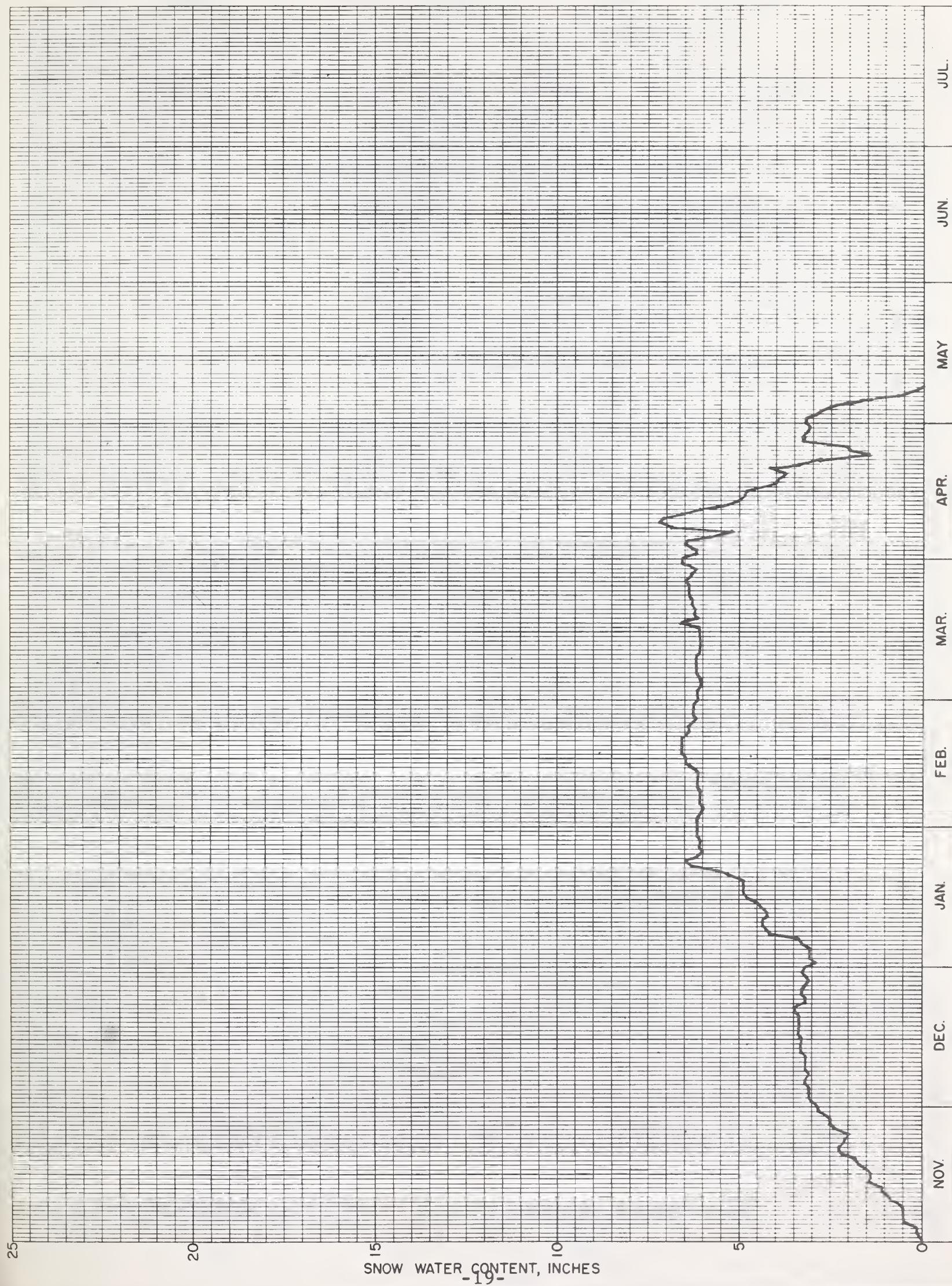
SNOW PILLOW DATA
WATER YEAR 1969

LICK CREEK

No. 10D13

Elev. 6860

Drainage: Gallatin





SNOW PILLOW DATA
WATER YEAR 1969

MAYNARD CREEK

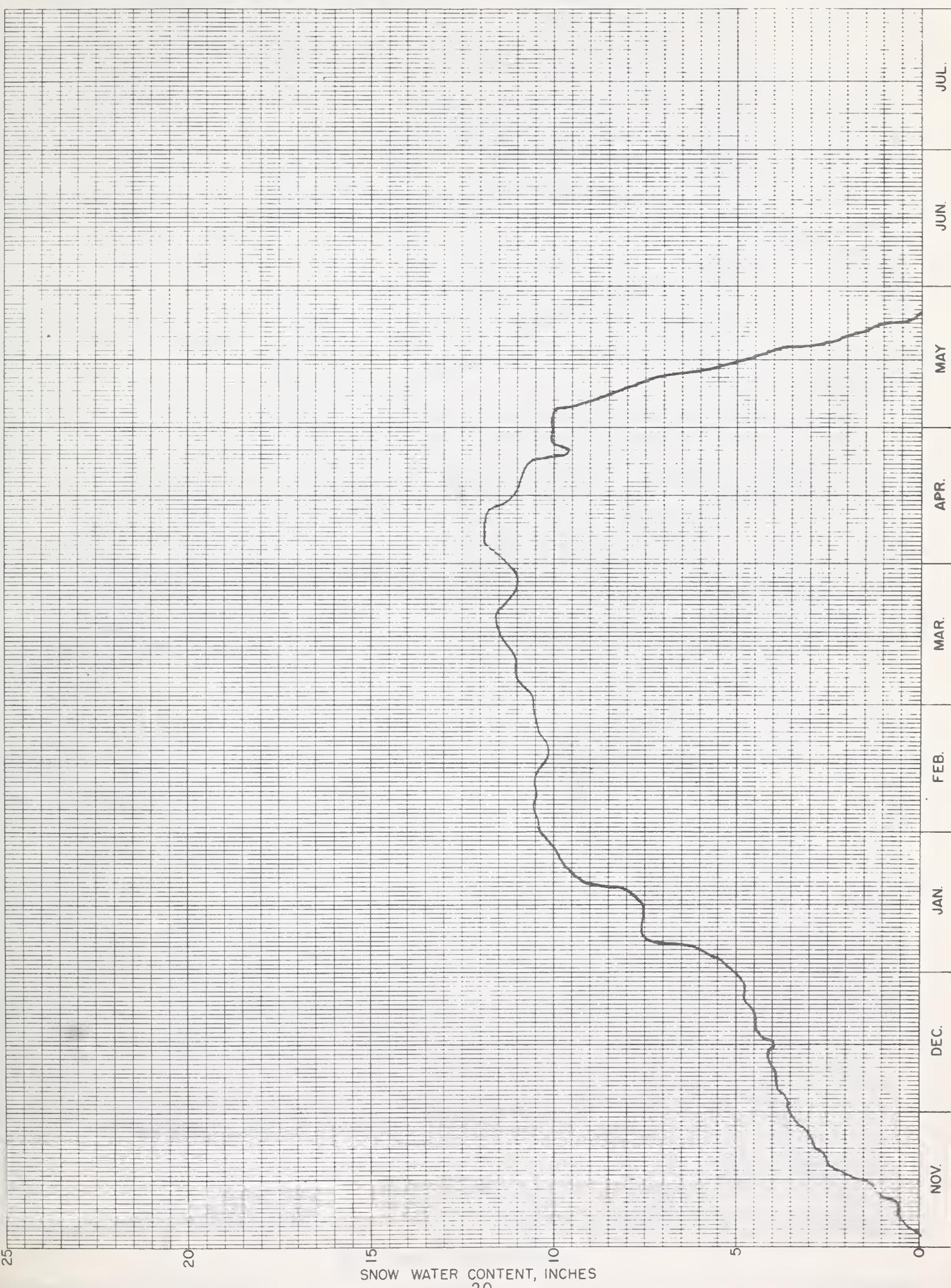
No. 10D18

Elev.

6210

Drainage:

Gallatin



SNOW PILLOW DATA
WATER YEAR 1969

SHOWER FALLS

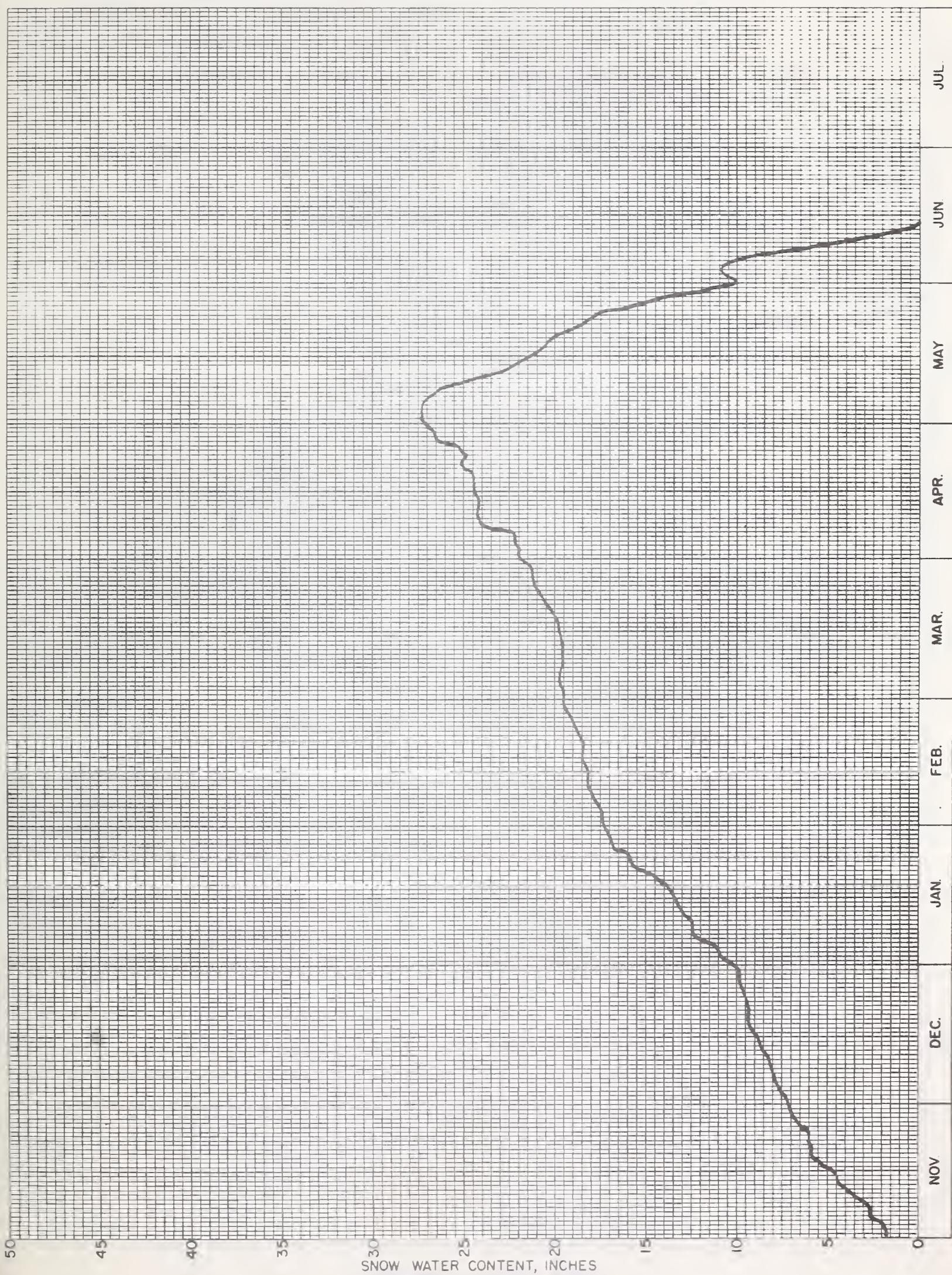
No. 10D16

Elev.

8100

Drainage:

Gallatin





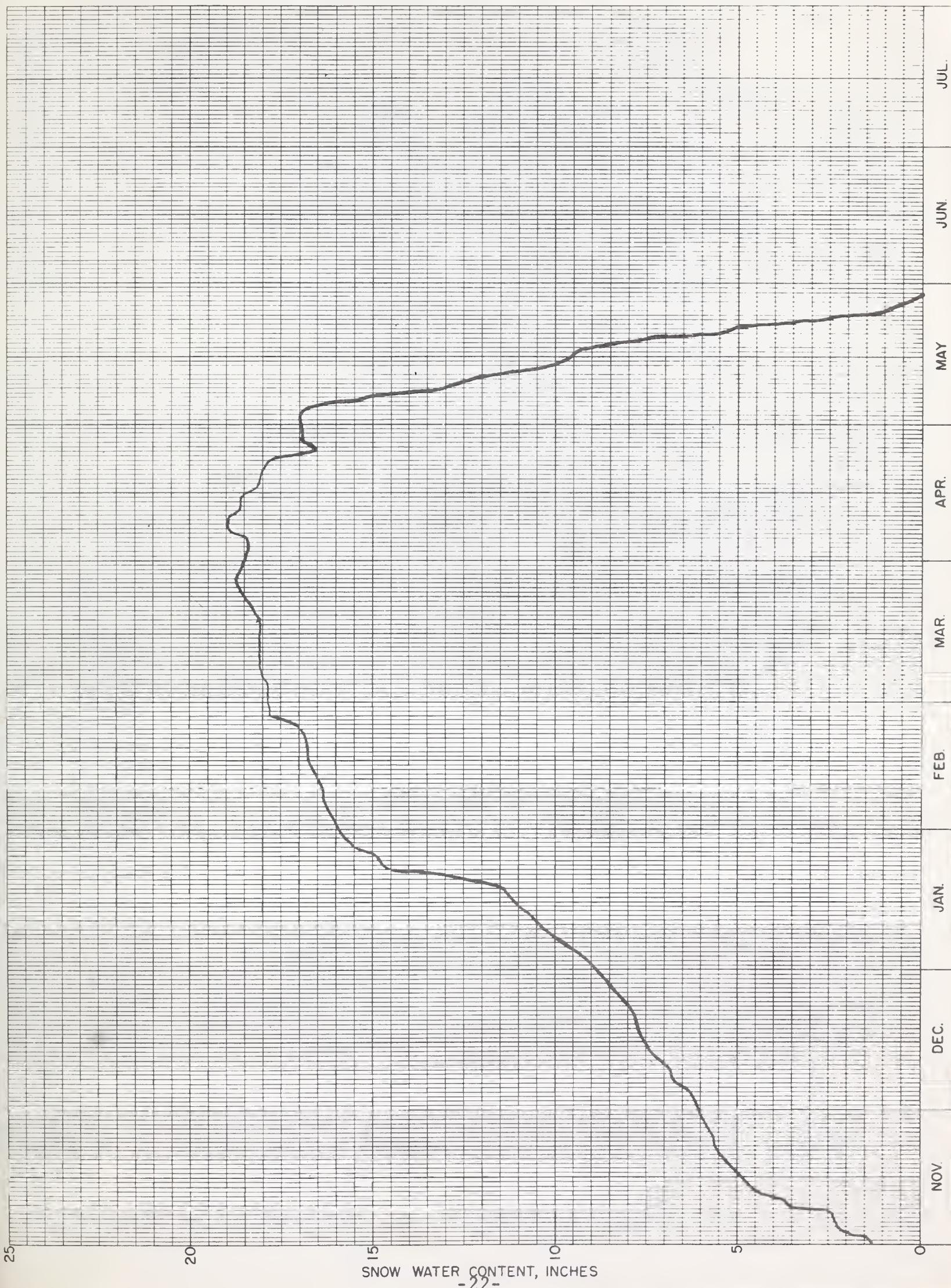
SNOW PILLOW DATA
WATER YEAR 1969

TAYLOR PEAKS

No. 11D13

Elev. 8500

Drainage: Gallatin





SNOW PILLOW DATA
WATER YEAR 1969

DEADMAN CREEK

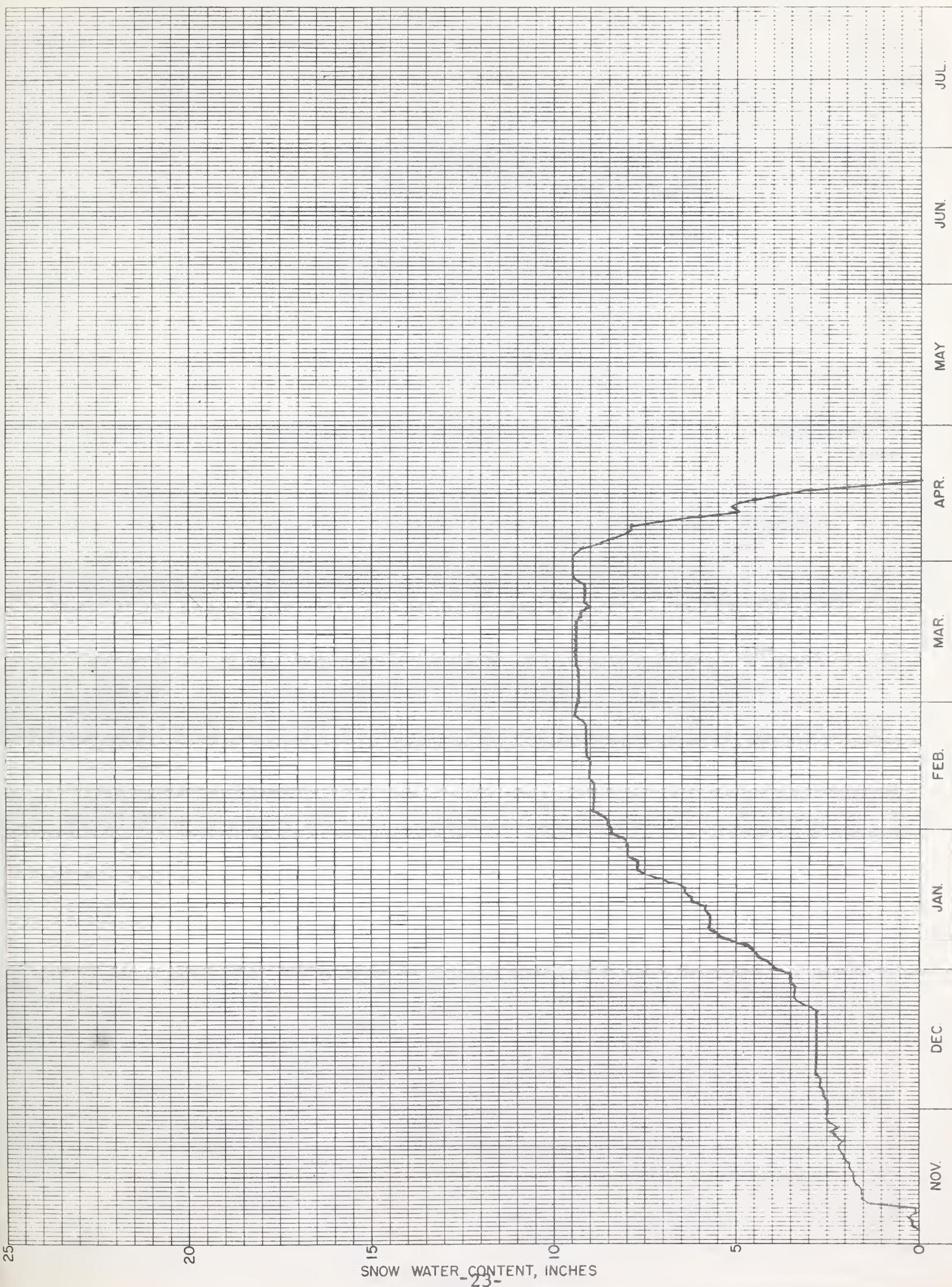
No. 10C09

Elev.

6450

Drainage:

Jefferson





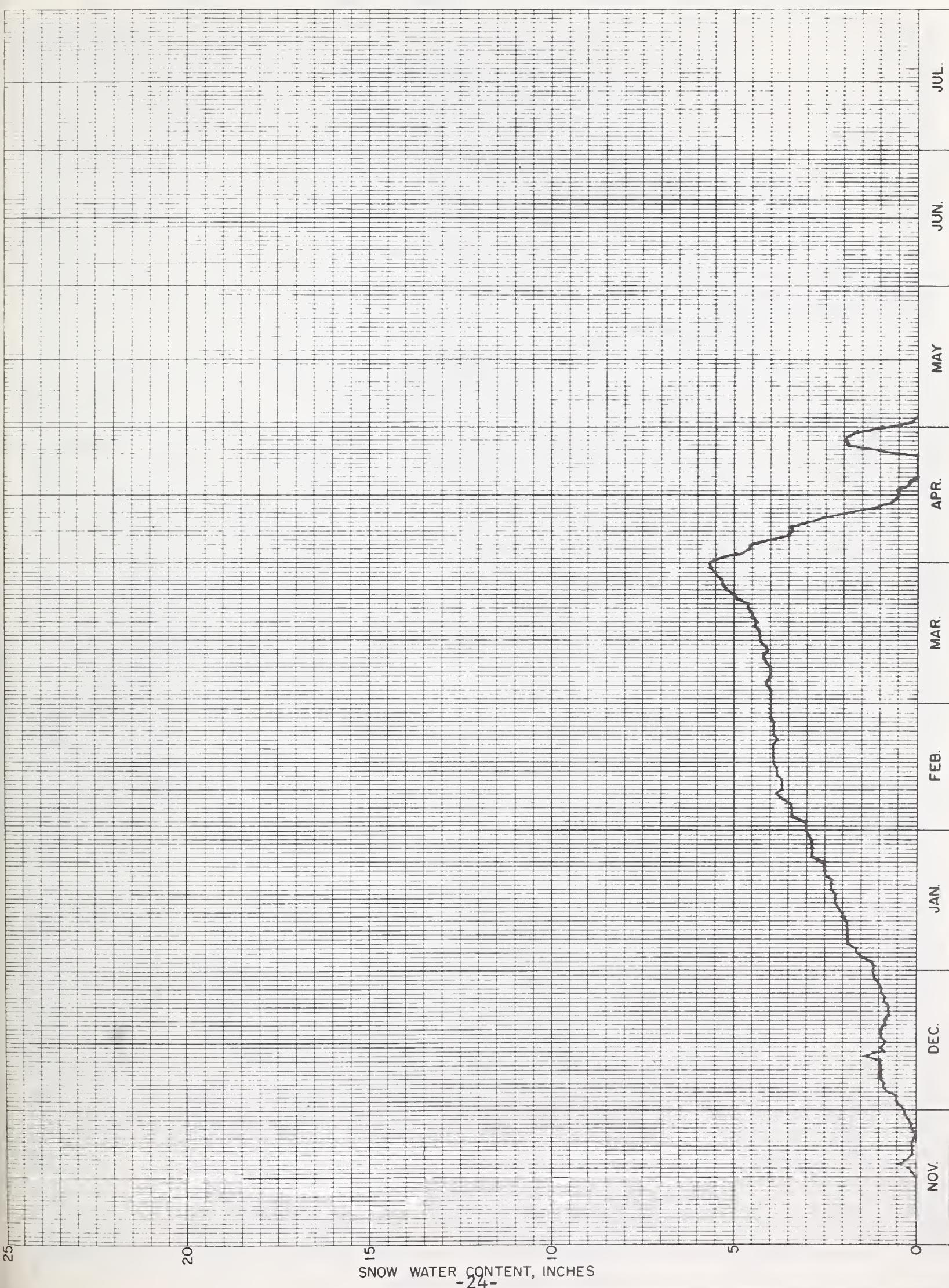
SNOW PILLOW DATA
WATER YEAR 1969

ROCKY BOY

No. 9A01

Elev. 4700

Drainage: Milk





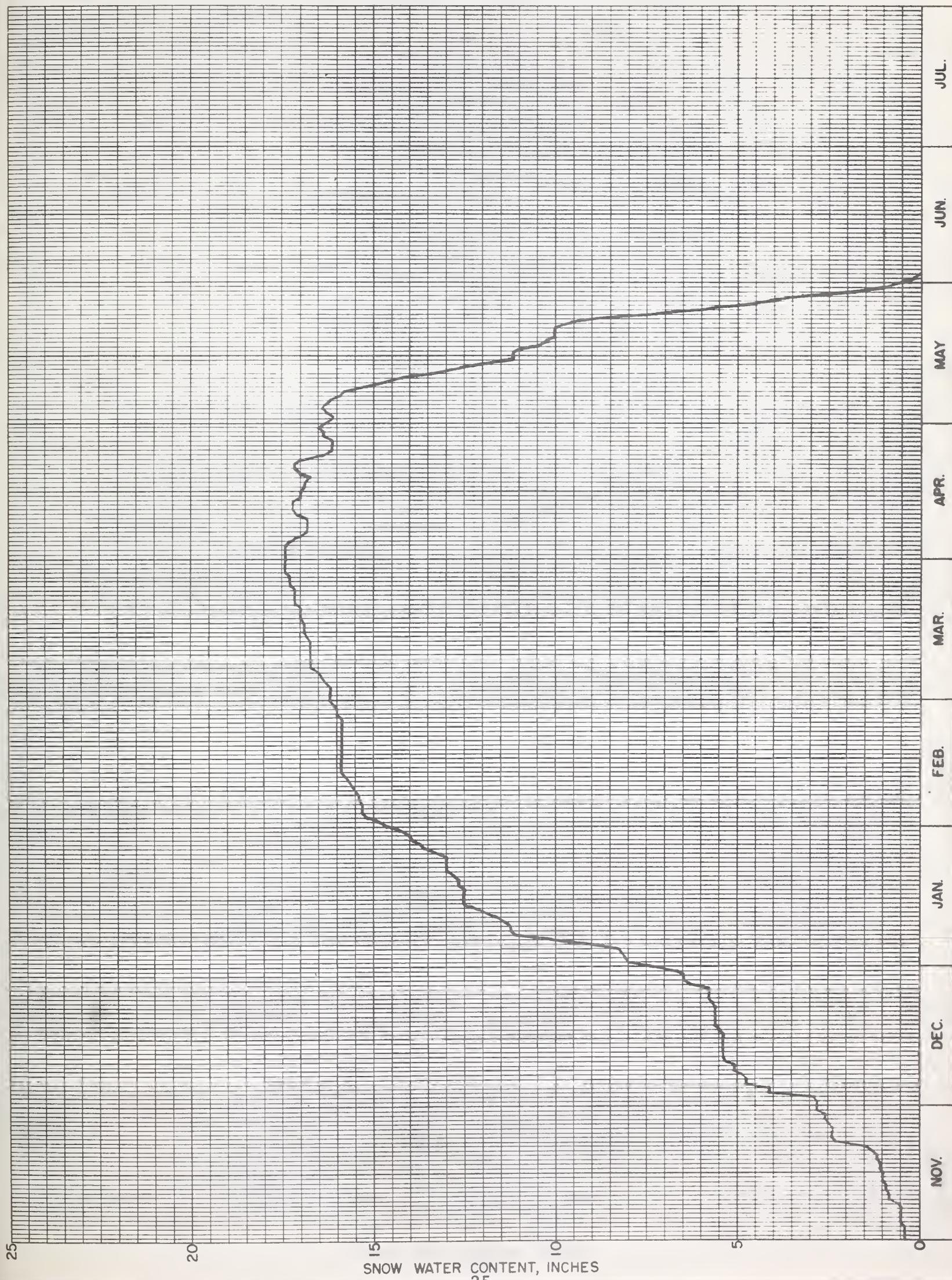
SNOW PILLOW DATA
WATER YEAR 1969

MOUNT LOCKHART

No. 12B12

Elev. 6400

Drainage: Sun-Teton-Marias





SNOW PILLOW DATA
WATER YEAR 1969

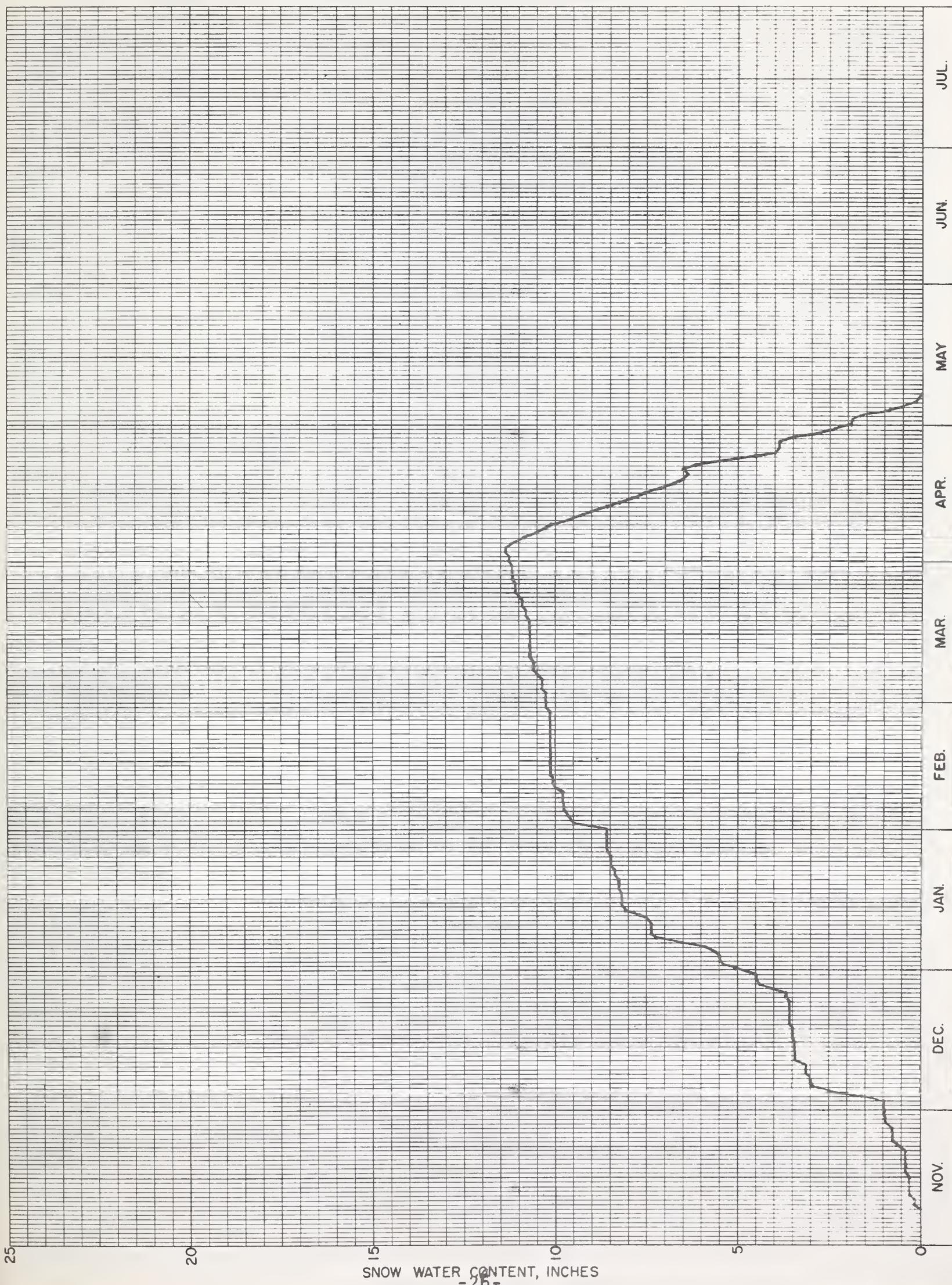
WALDRON

No. 12B13

Elev.

5600

Drainage: Sun-Marias-Teton

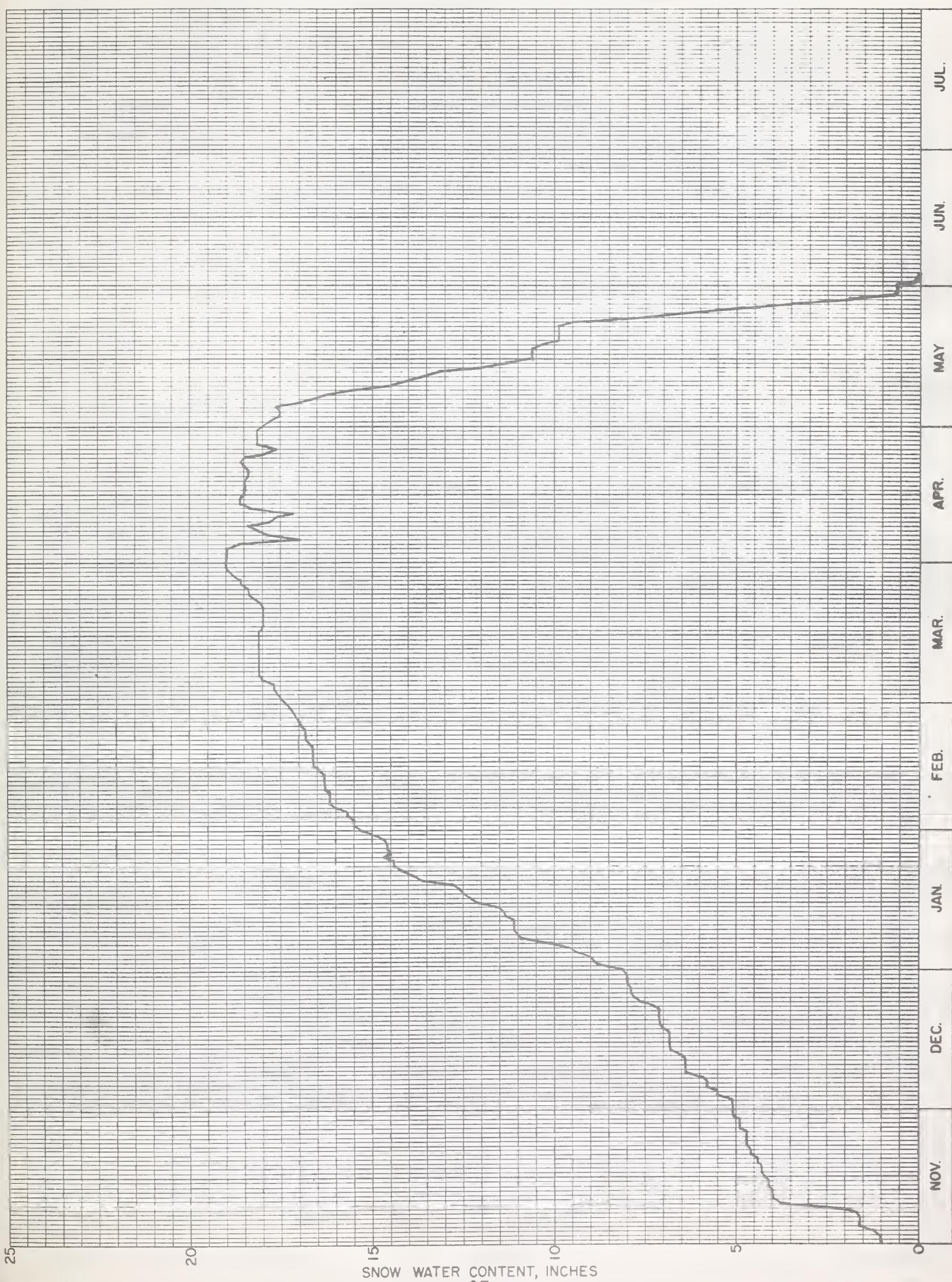




SNOW PILLOW DATA
WATER YEAR 1969

SPUR PARK

No. 10C06 Elev. 8000 Drainage: Judith



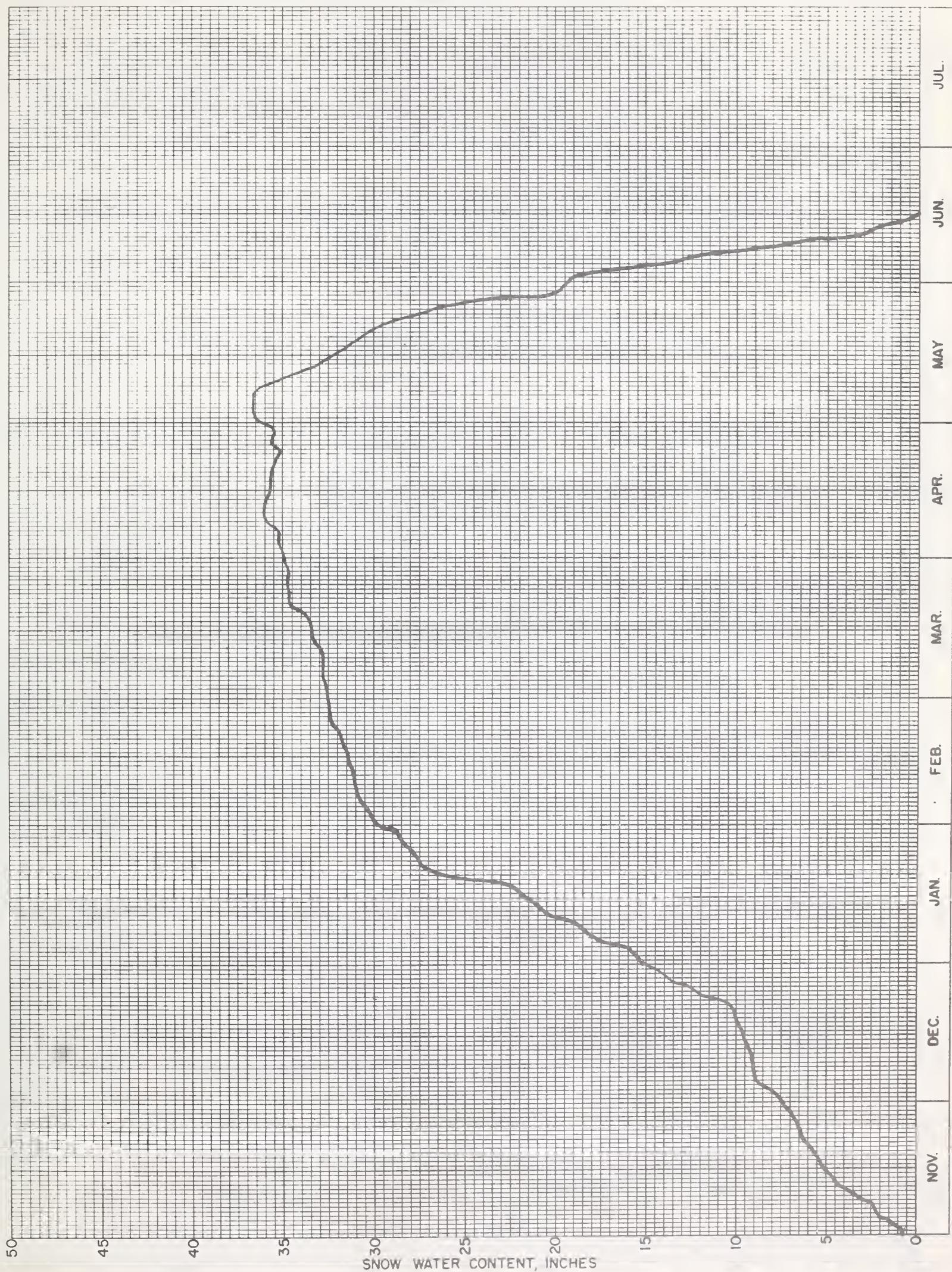
SNOW PILLOW DATA
WATER YEAR 1969

FISHER CREEK

No. 9D06

Elev. 9100

Drainage: Yellowstone



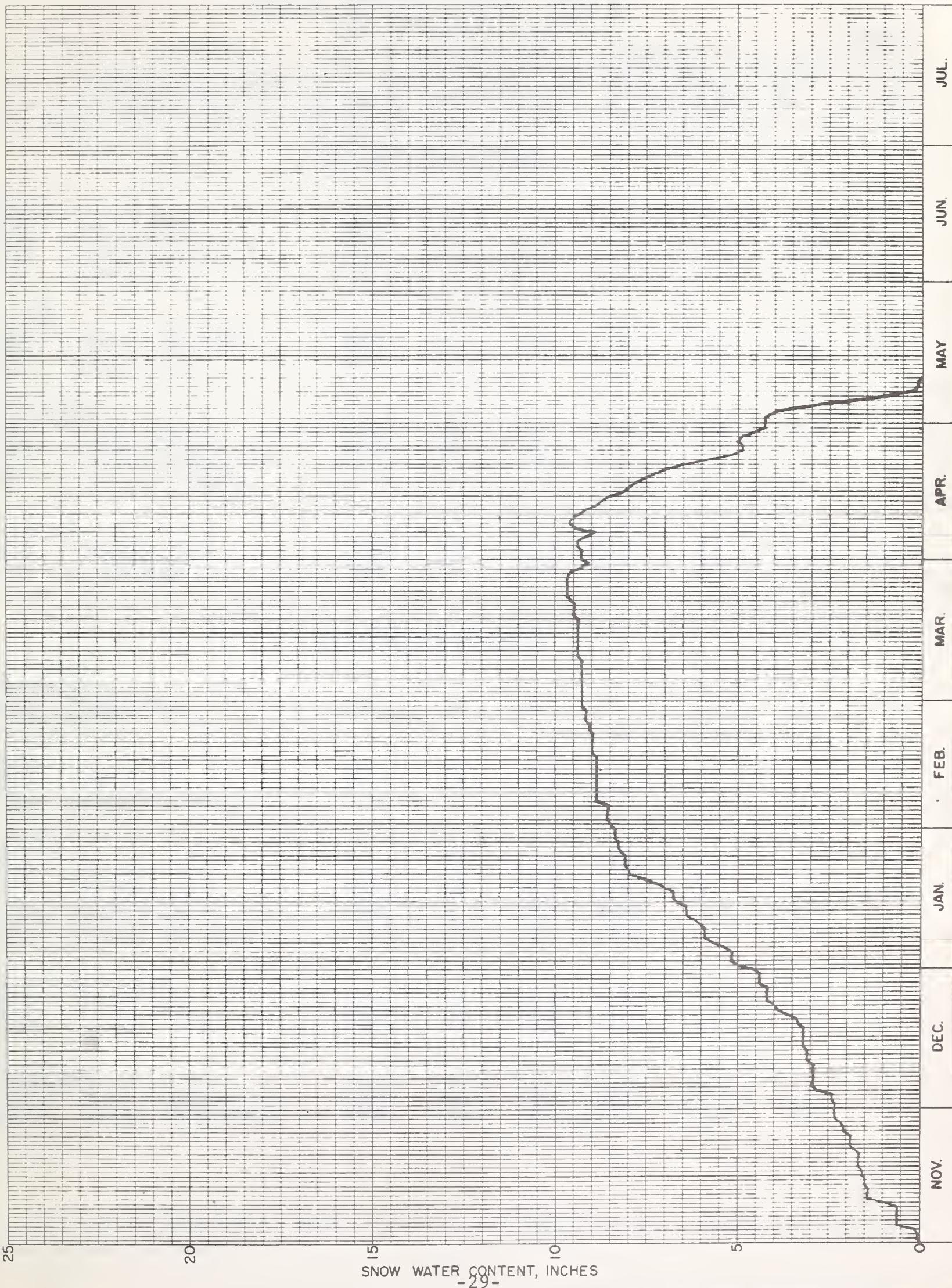
SNOW PILLOW DATA
WATER YEAR 1969

NORTHEAST ENTRANCE

No. 10D07

Elev. 7350

Drainage: Yellowstone





SOIL MOISTURE DATA

AS OF JULY 1, 1969

(Inches)

SOIL MOISTURE STATION			SOIL PROFILE		CURRENT DATA		PAST RECORD	
NO.	NAME	ELEVATION	DEPTH	FIELD CAPACITY	DATE OF SURVEY	SOIL MOISTURE	LAST YEAR	** AVERAGE

COLUMBIA RIVER BASIN

Kootenai

15B15M	Baree Trail	3800	48	7.5	7/14	5.7	5.5	-
14A10M	Murphy Lake R. S.	3000	48	22.6	7/1	22.6	21.0	-
15A02M	Raven R. S.	3050	48	23.0	7/14	15.7	18.7	-

Flathead

13A02M	Desert Mountain	5600	54	8.4	6/30	9.3	9.2	8.3
13A05M	Marias Pass	5250	54	6.5	7/1	5.9	5.4	5.2

Clark Fork

13C13M	Black Pine	7100	48	10.0	6/30	8.8	8.8	-
13B19M	Seeley Lake R. S.	4030	48	11.9			9.1	-
13C03M	Skalkaho Summit	7260	48	10.8	6/30	10.4	10.1	-

Bitterroot

13D18M	Gibbons Pass	7100	48	7.1	6/30	6.6	6.6	6.4
14C05M	Lolo Pass	5250	48	10.6	6/27	9.0	9.3	9.6

MISSOURI RIVER BASIN

Beaverhead

11E13M	Lakeview	6700	48	15.3	7/1	10.2	7.5	13.2
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Madison

11D04M	Red Bluff	4800	40	4.7			-	1.3
11E07M	West Yellowstone	6700	48	6.5	6/28	2.8	2.6	-

Gallatin

10D15M	Bridger Bowl	7250	48	17.0	6/30	16.7	16.8	-
11D02M	College Site	4856	54	14.5	7/3	15.1	14.8	11.2
10D13M	Lick Creek	6860	48	18.8	6/30	16.9	18.1	-
11E06M	Twenty-One Mile	7150	48	10.0	6/28	9.3	7.9	8.4

Missouri Main Stem

10C01M	Kings Hill	7420	48	11.8	6/30	10.8	10.8	10.8
12C08M	Stemple Pass	6350	48	5.9	6/27	5.6	4.6	5.0

Yellowstone

10D11M	Battle Ridge	6020	48	17.6	6/30	16.1	16.5	15.0
10D07M	Northeast Entrance	7350	48	9.4	7/1	10.4	8.8	9.1

SOIL MOISTURE DATA

AS OF AUGUST 1, 1969

(inches)

SOIL MOISTURE STATION			SOIL PROFILE		CURRENT DATA		PAST RECORD	
NO.	NAME	ELEVATION	DEPTH	FIELD CAPACITY	DATE OF SURVEY	SOIL MOISTURE	LAST YEAR	** AVERAGE

COLUMBIA RIVER BASIN

Kootenai

15B15M	Baree Trail	3800	48	7.5	8/10	3.1	3.3	-
14A10M	Murphy Lake R. S.	3000	48	22.6	8/1	19.2	18.5	-
15A02M	Raven R. S.	3050	48	23.0	8/10	15.9	16.8	-

Flathead

13A02M	Desert Mountain	5600	54	8.4	7/29	6.7	6.4	6.3
13A05M	Marias Pass	5250	54	6.5	8/1	4.3	4.1	3.8

Clark Fork

13C13M	Black Pine	7100	48	10.0	7/31	8.5	8.6	-
13B19M	Seeley Lake R. S.	4030	48	11.9	8/8	7.7	-	-
13C03M	Skalkaho Summit	7260	48	10.8	7/31	9.4	10.5	-

Bitterroot

13D18M	Gibbons Pass	7100	48	7.1	7/28	4.9	4.3	4.6
14C05M	Lolo Pass	5250	48	10.6	7/31	4.9	5.4	6.0

MISSOURI RIVER BASIN

Beaverhead

11E13M	Lakeview	6700	48	15.3	8/2	6.3	5.4	8.5
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Madison

11D04M	Red Bluff	4800	40	4.7			1.3	1.3
11E07M	West Yellowstone	6700	48	6.5			1.9	-

Gallatin

10D15M	Bridger Bowl	7250	48	17.0	7/30	14.8	15.6	-
11D02M	College Site	4856	54	14.5	8/1	11.1	11.1	8.3
10D13M	Lick Creek	6860	48	18.8	7/31	16.0	11.6	-
11E06M	Twenty-One Mile	7150	48	10.0			4.1	5.1

Missouri Main Stem

10C01M	Kings Hill	7420	48	11.8	8/1	9.4	9.4	9.2
12C08M	Stemple Pass	6350	48	5.9	7/25	4.6	3.1	4.1

Yellowstone

10D11M	Battle Ridge	6020	48	17.6	7/30	12.8	11.7	11.0
10D07M	Northeast Entrance	7350	48	9.4	7/29	7.4	6.9	6.8



SOIL MOISTURE DATA

AS OF SEPTEMBER 1, 1969

(Inches)

SOIL MOISTURE STATION			SOIL PROFILE		CURRENT DATA		PAST RECORD	
NO.	NAME	ELEVATION	DEPTH	FIELD CAPACITY	DATE OF SURVEY	SOIL MOISTURE	LAST YEAR	** AVERAGE

COLUMBIA RIVER BASIN

Kootenai

15B15M	Baree Trail	3800	48	7.5	9/6	2.4	5.5	-
14A10M	Murphy Lake R. S.	3000	48	22.6	9/4	18.3	19.3	19.1
15A02M	Raven R. S.	3050	48	23.0	9/6	15.8	18.0	-

Flathead

13A02M	Desert Mountain	5600	54	8.4	8/29	4.7	7.8	5.3
13A05M	Marias Pass	5250	54	6.5	9/1	3.2	4.0	3.5

Clark Fork

13C13M	Black Pine	7100	48	10.0	8/28	7.8	8.8	-
13B19M	Seeley Lake R. S.	4030	48	11.9		-	-	-
13C03M	Skalkaho Summit	7260	48	10.8	8/29	8.6	10.5	-

Bitterroot

13D18M	Gibbons Pass	7100	48	7.1	8/29	2.5	5.0	4.5
14C05M	Lolo Pass	5250	48	10.6		-	4.1	4.6

MISSOURI RIVER BASIN

Beaverhead

11E13M	Lakeview	6700	48	15.3	9/1	5.8	8.2	6.9
--------	----------	------	----	------	-----	-----	-----	-----

Madison

11D04M	Red Bluff	4800	40	4.7		-	1.4	
11E07M	West Yellowstone	6700	48	6.5	9/1	1.2	3.1	-

Gallatin

10D15M	Bridger Bowl	7250	48	17.0	9/5	15.9	16.6	-
11D02M	College Site	4856	54	14.5	8/29	12.3	9.7	7.4
10D13M	Lick Creek	6860	48	18.8	9/2	14.8	17.0	-
11E06M	Twenty-One Mile	7150	48	10.0	9/1	3.4	8.0	3.7

Missouri Main Stem

10C01M	Kings Hill	7420	48	11.8	8/29	7.2	9.0	8.3
12C08M	Stemple Pass	6350	48	5.9	9/3	3.0	3.6	4.1

Yellowstone

10D11M	Battle Ridge	6020	48	17.6	9/5	9.2	13.5	9.6
10D07M	Northeast Entrance	7350	48	9.4	9/2	5.1	9.3	5.9

SOIL MOISTURE DATA

AS OF OCTOBER 1, 1969

(Inches)

SOIL MOISTURE STATION			SOIL PROFILE		CURRENT DATA		PAST RECORD	
NO.	NAME	ELEVATION	DEPTH	FIELD CAPACITY	DATE OF SURVEY	SOIL MOISTURE	LAST YEAR	**AVERAGE

COLUMBIA RIVER BASIN

Kootenai

15B15M	Baree Trail	3800	48	7.5		6.6	5.2
14A10M	Murphy Lake R. S.	3000	48	22.6	10/3	18.8	19.8
15A02M	Raven R. S.	3050	48	23.0		18.8	-

Flathead

13A02M	Desert Mountain	5600	54	8.4	10/6	7.1	8.8	5.8
13A05M	Marias Pass	5250	54	6.5	9/30	3.6	6.4	3.9

Clark Fork

13C13M	Black Pine	7100	48	10.0	9/30	7.5	8.5	-
13B19M	Seeley Lake R. S.	4030	48	11.9	10/2	4.0	-	-
13C03M	Skalkaho Summit	7260	48	10.8	9/30	10.2	10.7	-

Bitterroot

13D18M	Gibbons Pass	7100	48	7.1	9/29	2.4	6.5	5.0
14C05M	Lolo Pass	5250	48	10.6	10/2	3.2	7.1	5.4

MISSOURI RIVER BASIN

Beaverhead

11E13M	Lakeview	6700	48	15.3		6.1	9.2
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Madison

11D04M	Red Bluff	4800	40	4.7		-	1.9
11E07M	West Yellowstone	6700	48	6.5	9/28	1.5	3.4

Gallatin

10D15M	Bridger Bowl	7250	48	17.0	9/26	16.3	16.6	-
11D02M	College Site	4856	54	14.5	10/3	9.6	9.2	7.5
10D13M	Lick Creek	6860	48	18.8	9/25	15.1	17.9	-
11E06M	Twenty-One Mile	7150	48	10.0	9/28	3.6	7.8	4.0

Missouri Main Stem

10C01M	Kings Hill	7420	48	11.8	10/1	5.3	10.0	7.9
12C08M	Stemple Pass	6350	48	5.9	9/30	3.0	5.0	4.0

Milk

9A05M	Beaver Creek	3950	48	20.9	9/26	6.7	-	-
9A01M	Rocky Boy	4700	36	10.1	9/26	6.4	-	-

Yellowstone

10D11M	Battle Ridge	6020	48	17.6	9/26	9.1	13.8	10.4
10D07M	Northeast Entrance	7350	48	9.4	9/30	3.9	9.4	6.8



RESERVOIR STORAGE DATA

AS OF SEPTEMBER 30, 1969

(1000 Acre Feet)

BASIN	RESERVOIR	USEABLE CAPACITY	USEABLE STORAGE		
			THIS YEAR	LAST YEAR	AVERAGE

COLUMBIA RIVER BASIN

Flathead	Hungry Horse	3,428.0	2,726.0	3,428.0	3,331.0
	Flathead Lake	1,791.0	1,700.0	1,785.0	1,699.0
	Camas (Sum of 4)	45.2	16.7	11.4	24.9
	Mission Valley (Sum of 8)	100.3	12.6	85.3	17.6
Clark Fork	Georgetown Lake	31.0	29.2	30.4	26.7
	Nevada Creek	12.6		6.2	5.2
	Noxon Rapids	334.6	331.0	331.4	321.3
Bitterroot	Como	34.9	19.7	5.8	1.9
	Painted Rocks	31.7	29.0	31.4	25.2

MISSOURI RIVER BASIN

Beaverhead	Clark Canyon	328.9	127.5	140.2	103.0
	Lima	84.0	41.1	42.1	17.3
Ruby	Ruby	38.8	8.7	19.2	8.6
Madison	Hebgen Lake	377.5	326.4	331.5	299.8
	Ennis Lake	41.0	39.5	39.7	36.5
Gallatin	Middle Creek	8.0	3.5	5.4	2.4
Missouri	Canyon Ferry	2,043.0	1,734.0	1,861.0	1,749.0
	Hauser & Helena	61.9	29.1	60.7	58.6
	Lake Helena	10.4	10.4	10.0	9.5
	Holter Lake	81.9	74.2	77.2	75.7
	Smith River	10.7	3.3	6.8	5.2
	Durand	7.0	1.7	4.6	3.3
	Martinsdale	23.1	5.2	11.0	6.6
	Deadman's Basin	72.2	18.6	38.6	33.9
	Fort Peck	19,410.0	17,530.0	17,350.0	11,850.0
Sun	Gibson	105.0	94.4	38.1	35.5
	Willow Creek	32.2	16.5	20.5	19.0
	Pishkun	32.0	16.0	18.5	17.1
Marias	Lower Two Medicine	16.6		3.0	3.5
	Four Horns	19.2		13.5	11.0
	Swift	30.0	14.8	16.7	13.0
	Lake Frances	112.0	80.6	67.0	83.6
	Tiber	1,313.0	605.4	466.1	689.6
Milk	Fresno	127.2	81.5	107.6	67.8
	Nelson	66.8	45.5	51.0	44.1
	Lake Sherburne	66.1		3.1	7.0
Yellowstone	Mystic Lake	20.8	19.5	20.2	20.4
	Tongue River	68.0		38.3	20.6
	Cooney	27.5	9.1	18.8	11.0
Big Horn	Yellowtail	1,356.0	867.1	829.4	-

Agencies and Organizations Cooperating in Montana Snow Surveys

U. S. Forest Service
Region I, Missoula, Montana
Montana Forests and Ranger
Districts

U. S. Geological Survey
Helena, Montana
Portland, Oregon

U. S. Army Corps of Engineers
Portland, Oregon
Seattle, Washington
Walla Walla, Washington
Omaha, Nebraska

U. S. Indian Irrigation Service
St. Ignatius, Montana

U. S. Weather Bureau
Helena, Montana
Portland, Oregon
Kansas City, Missouri

U. S. Bureau of Sports Fisheries
and Wildlife
Red Rock Lakes Refuge
Monida, Montana

U. S. Bureau of Reclamation
Billings, Montana
Boise, Idaho

U. S. Bonneville Power Administration
Portland, Oregon

U. S. Soil Conservation Service
Montana, Wyoming, Idaho

Soil and Water Conservation Districts
Montana Counties

U. S. National Park Service
Yellowstone National Park
Glacier National Park

Montana Power Company
Butte, Montana

Montana Water Resources Board
Helena, Montana

North Montana Branch Station
Agricultural Experiment Station
Havre, Montana

Montana State University
Agricultural Experiment Station
Bozeman, Montana

University of Montana
School of Forestry
Missoula, Montana

Water Rights Branch, Dept. of
Lands and Forests
Victoria, British Columbia

Department of Energy, Mines and
Resources
Calgary, Alberta

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